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27 November 1984

Worldwide Report

NUCLEAR DEVELOPMENT AND PROLIFERATION

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BRIEFS

END TO PLUTONIUM SHIPMENTS URGED--Tokyo, 12 No, KYODO--Representatives of SOHYO (General Council of Trade Unions of Japan) and the Japan Socialist Party Monday urged the Science and Technology Agency Monday to discontinue plutonium transport. SOHYO and Socialist representatives made this request in connection with the 16,910-ton Seishin Maru, a mineral ore cargo ship currently transporting plutonium from France, which is scheduled to enter Tokyo port sometime this week. The agency officials refused to reveal the arrival time or route of the plutonium transport ship, but the SOHYO and JSP representatives said it would enter Tokyo port early Thursday morning. From Tokyo port, the plutonium will be transported by land to Tokaimura in Ibaraki Prefecture, they said. The representatives handed agency officials a written demand urging immediate suspension of the plutonium transport. [Text] [Tokyo KYODO in English 1239 GMT 12 Nov 84 OW]

CSO: 5100/4503

OFFICIAL RELATES NUCLEAR ENERGY DEVELOPMENT

OW200848 Beijing Domestic Service in Mandarin 2200 GMT 15 Oct 84

[Report by (Li Wen) of the Ministry of Nuclear Industry: "After the Rising of China's First Mushroom Cloud"]

[Text] Dear listeners, our country started to develop the atomic bomb at the end of the 1950's. By relying on our own efforts, we produced an atomic bomb in less than 6 years, and became the fifth country with the know-how to produce atomic bombs, following the United States, the Soviet Union, Britain, and France. This was indeed extraordinary. The design and manufacture of the atomic bomb require the mastery of various sciences and technologies, and a relatively high industrial level. For instance, the materials for achieving fission include U-235 and Pu-239, and their purity must be higher than 90 percent. However, natural uranium only has a small amount of U-235, or 0.7 percent, and contains mostly U-238. Pu-239 does not occur naturally. It is produced through neutron diffraction of nuclear material with U-238 in a reactor. The method and technique for separating U-235 from natural uranium, and making it more than 90 percent pure, and producing Pu-239 through transmutation in a reactor are quite complicated. Those processes would also require many kinds of special equipment, instruments and new materials.

China's scientists and technicians displayed the revolutionary spirit of self-reliance and hard struggle, overcame all difficulties, and mastered the design and technology for manufacturing the atomic bomb. They mastered the techniques of separating uranium isotopes, producing Pu-239, and processing nuclear materials, and developed various kinds of special equipment and new materials to meet the need. Thus, China successfully exploded its first atomic bomb.

Following the rise of China's first mushroom cloud, our country needed only 2 years to successfully launch a guided missile, capable of carrying a nuclear weapon, in October 1966. In June 1967, our country again successfully detonated its first hydrogen bomb. From the first explosion of an atomic bomb to the first explosion of a hydrogen bomb, it took the United States 7 years and 4 months, the Soviet Union 4 years, Britain 4 years and 8 months, and France 8 years and 6 months. China only needed 2 years and 8 months. Our development of nuclear weapons is the fastest in the world.

In the course of developing nuclear weapons, our country's nuclear industry has gradually grown in strength, and formed a relatively complete nuclear industrial system. We have gathered a contingent of scientists and technicians, who are quite good in both political character and professional skill, and have relatively abundant practical experience. At the same time, our country has begun to apply nuclear science and technology to civilian use. Since the convocation of the Third Plenary Session of the 11th CPC Central Committee, the party Central Committee and the State Council have decided on a new policy for developing our country's nuclear industry; that is, on the premise of insuring priority to military use, the focus should be shifted to serving the national economy and the people's livelihood. This correct policy has shown the orientation for the development of China's nuclear industry, and our country's nuclear science and technology have entered a new development period.

After many years of hard work, our country has achieved significant results in promoting the use of radioactive isotopes. For instance, through radiation breeding, more than 160 new strains of grains, cotton, oil-bearing crops, vegetables, and fruit have been developed in agricultural production. In medical science, more than 700 hospitals in our country now have radioisotope medicine and equipment for examination, diagnosis, and treatment of illness, and have been engaged in medical research in this respect. In industrial production, nuclear electronic instruments, such as meters to determine thickness, density, and volume, fire alarms, and static electricity suppressors are being employed by more and more plants and projects.

Using nuclear energy to generate electricity is an important part of the use of nuclear science and technology to serve the national economy and the people's livelihood. Currently, our country is building two nuclear power stations. One is (Shishan) Nuclear Power Plant located in Zhejiang Province's Haiyan County, with a capacity of 300,000 kw. This nuclear power station is designed and built by ourselves. Another is the Guangdong Nuclear Power Station located in Guangdong Province's Shenzhen Special Economic Zone, with two sets of 900,000 kw generator. This station is being built with funds from the Guangdong Electric Power Company and the Hong Kong China Electric Power Company. Within this century, our country plans to build large nuclear power stations in eastern and northern China.

There is a broad future for the application of nuclear science and technology. China's nuclear science and technology are just unfolding. In the course of realizing the four modernizations, nuclear science and technology will certainly make an even greater contribution.

CSO: 5100/4115

BEIJING TV SHOWS NUCLEAR SUBMARINES, MISSILES

HK300926 [Editorial Report] Beijing Domestic Television Service in Mandarin at 1100 GMT on 27 October during its regular evening news program carries a 1.5-minute film clip concerning the PRC Submarine Corps and its nuclear submarines. The report is in two segments: the first concerns a parade to mark the 30th founding anniversary of the Submarine Corps, and the second shows a PRC "nuclear submarine" launching a sea-to-air missile.

The first part focuses on "Fu Jize, deputy commander of the Navy and first commander of the Submarine Corps," attending a procession on the parade grounds of the PLA Navy's submarine academy to mark the 30th founding anniversary of the Submarine Corps.

CSO: 5100/4148

TOLENTINO'S UN TRIP, USSR ACCESS TO PLUTONIUM DISPOSAL

Quezon City ANG PAHAYAGANG MALAYA in English 11 Sep 84 pp 5, 8

["Town Crier" column by Vic Barranco: "Tolentino's Trial to Presidency"]

[Text]

On or about Sept. 15, Foreign Affairs Arturo M. Tolentino, will have left for New York to attend the opening of the 1984 UN General Assembly. Before that, he will of course exchange views with Ambassador Luis Moreno Salcedo, Philippine permanent delegate to the world organization, on the positions the Philippines will take on various international issues on the UN agenda.

Minister Tolentino's sidetrack mission in America as a member of the Batasan Pambansa, is to gather the latest reports on developments in the US presidential election campaign from the representatives of the political section of the Philippine foreign ministry who have been posted at strategic political points throughout America, and he will then prepare his own evaluation of the prospects of President Ronald Reagan and Walter Mondale for the guidance of Mr. Marcos in framing his policies toward the United States government in the coming months.

Reagan has already shown his dislike for Mr. Marcos, and would not do anything to help Mr. Marcos maintain a good image among the 52-million subjects of his martial law regime after the assassination of Opposition Leader Benigno S. Aquino, Jr. on Aug. 21, 1983. We recall that Reagan omitted the Philippines on his swing through Far Eastern countries last year, in sympathetic response to the protest of the angry Filipino population over the Aquino liquidation.

Democratic standard bearer Mondale is not friendly either to Mr. Marcos' leadership, because of its repression of human rights and persecution of all citizens opposed to the Marcos chosen form of government.

Mondale, like his former President Jimmy Carter, is an uncompromising champion of human rights and freedom for third world countries, and is therefore frontally against Marcos' political, and economic policies with the dominant, cruel military intimidation.

So, whoever gets to the White House next year, will place Mr. Marcos in a cul-de-sac, in a situation from which there will be no more freewheeling for him with his martial law ways.

* * *

The other big job of Minister Tolentino in his debut as foreign minister in the UN, is to seek a painless official withdrawal of the Philippine government's claim to Sabah. If he can resist the will of Mr. Marcos on this issue and succeed in the withdrawal of the claim, Mr. Tolentino will do the Asean a great service, steadying the Asean boat on the perilous political, economic and ideological wa-

ters, and establish a basis of lasting peace in the region.

The Malaysian government never believed the repeated announcements by Mr. Marcos through the local and international press services that the Philippines no longer harbors any territorial aggrandizement on Sabah. Put that statement in black and white, was the attitude of the Malaysian government. And the Malaysian position is supported by Prime Minister Lee Kwan Yew and by Indonesian President Suharto, whose country is also apprehensive about the tricks and verbal blinkers that the Philippine interim government today has been resorting to in dealing with its neighbors in Asia.

The Philippines is on clear road to back out of the Sabah colonization adventure. Colonization is now passe in modern international relations, although it takes the form of USSR neo-colonialism. The Philippine government can revert its official claim on Sabah to a status of a private family matter between the heirs of the Sultan of Sulu who claim they are still entitled to an annual rental of a few thousand dollars under the 19th century contract called "lease in perpetuity" by a now defunct former Hongkong based British trading firm. The rights to all Sabah have been transferred to the independent and sovereign state of Malaysia. Why should Mr. Marcos insist on putting his finger into the political pie of Malaysia?

* * *

Now we Filipinos may ask Minister Tolentino to do another diplomatic mission, which is to ascertain if there is any contract in force between the Marcos government and Westinghouse, Inc. on the disposal of plutonium which is a strategic byproduct of the atomic reactor in Bataan. Plutonium is used in nuclear weapons.

There are reports that the atomic wastes will just be dumped in the waters off Palawan where Russian technologists and scientists, disguised as fishermen, are waiting to retrieve and transfer this plutonium by product and ship it to Vladivostok.

The National Power Corporation should never allow the Russians to get near the atomic plant in Bataan or recover the plutonium wastes reportedly "dumped" in the South China sea near Palawan. The nuclear bombs that will fall on the Philippines in the event of the outbreak of World War III may be made of plutonium from the Philippine atomic reactor.

Since Mr. Marcos' pet fear is the communist presence in the Philippines, and that he is quick to identify every Filipino who is against his martial law policies, against his financial extravagance, and against his goals of national penury and social decay, a communist or a dissident worth liquidating, why does not Mr. Marcos send his crack troops to Palawan to arrest Russian infiltrators who come in and out of the country freely through Palawan without any official permit, authority or visa? This is a dereliction of a patriotic duty and sacred responsibility to the people, particularly to the Christians in the Philippines who are against the communists.

If Mr. Tolentino can accomplish these missions on Sabah and the plutonium disposal, he will be hailed as a leader, and he will be politically boosted to challenge Mr. Marcos in the contest for the presidency in 1987.

CSO: 5100/4302

KOZLODUY NUCLEAR POWER STATION ANNOUNCES JOB OPENINGS

Sofia VECHERNI NOVINI in Bulgarian 14 Oct 84 (special page)

[Announcement of the Kozloduy Economic Nuclear Power Combine, bearer of the Bulgarian People's Republic Order 1st Class; published jointly by VECHERNI NOVINI and the Reklama Economic Enterprise]

[Text] In connection with the accelerated building and commissioning of the new capacities--the fifth and sixth power blocs--the combine will hire from anywhere in the country qualified specialists with completed higher education in the following areas:

Thermal power industry and nuclear power industry;

Production automation;

Electronic equipment;

Electrical measuring equipment;

Radio electronics;

Computers;

Communications equipment;

Industrial heat equipment;

Electric power industry (electric power plants and substations or electric power grids and systems);

Electric power supply and electric power equipment;

Electrical machines and apparatus;

Technology of metals and metal-processing machines;

Technology of machine-building and metal-cutting machines;

Technology of organic synthesis and fuels;

Water technology;

Mathematics;

Physics--production specialization;

Chemistry--production specialization.

Qualified specialists with completed secondary specialized training (technical school) for the following:

Electronic equipment;

Computers;

Production automation;

Radio and television equipment;

Nuclear electronics;

Electric power plants and grids;

Nuclear thermal power industry;

Electrical equipment of industrial enterprises;

Semiconducter equipment;

Communications equipment;

Thermal and hydroenergetic machines and equipment;

Internal combustion engines;

Machine-building technology--cold metal processing;

Technology of organic synthesis and fuels.

Qualified performing cadres with completed secondary vocational technical training (SPTU) for the following:

Electronic equipment assemblyman;

Power machine units assemblyman;

Machine assemblyman;

Electric power grids and systems assemblyman;

Electric power machines, equipment and apparatus assemblyman;

Control measuring equipment assemblyman;

Operator--assemblyman for power industry installations;

Operator--assemblyman for metal-cutting machines;

Operator for chemical-technological processes;

Welder.

The nature of the work at the Kozloduy SAEK [Economic Nuclear Power Industry Combine] requires of the applicants to show more than an average interest in the equipment and abilities in their chosen profession as well as a high degree of discipline and personal responsibility in the work.

The need for high professional skills will require for some of the personnel hired by the Kozloduy SAEK and specialists to be sent to the USSR and other socialist countries for training and specialization.

Wages will be based on the differentiated rate schedule for the third group (ETM with a 20 percent surplus).

Additionally, those hired will be given the following salary additions: no more than 40 leva as per Article 9(1) of the directive on additional labor wages (NDTV) for work under specific conditions;

No more than 40 leva as per Article 35 of the NDTV for manpower stabilization;

No more than 20 percent for lengthy and uninterrupted work--second group (for grade workers);

No more than 60 percent additional wage (labor participation coefficient).

Depending on the nature and place of work, specialists may retire between the ages of 50 and 55.

The Kozloduy SAEK offers the following advantages:

The children of the personnel have priority in entering secondary specialized schools (technical schools) and SPTU;

Priority is given in granting scholarships to children of combine workers attending VUZs, technical schools and SPTU;

Permission is issued for enrolling as correspondence students in higher educational institutions;

Possibilities are provided for regular and correspondence postgraduate studies in the country and abroad;

The opportunity is offered for enrolling in a VUZ by graduates of secondary specialized or secondary vocational-technical schools, for whom 8-month preparatory courses will be organized.

Social Benefits

The Kozloduy SAEK provides to those hired:

Apartments, based on family size;

Apartments for singles;

Daily free transportation;

Official transportation for commuters from the area's settlements;

Nutritious food in the cafeteria;

Rest vouchers for the enterprise's bases on the Black Sea and other tourist sites;

Additional annual leave of up to 22 working days.

The following documents must be presented by the applicants: petition, curriculum vitae, diploma proving completion of higher, secondary specialized or secondary vocational technical training in the corresponding subject, certificate of skill grade, regulation form health certificate, labor record and personal form (approved model).

Documents will be accepted every day at the personnel department of the Kozloduy SAEK, first floor, and the vocational training center, ninth floor.

For information you may call from anywhere in the country telephone code 0973-71--Kozloduy SAEK telephone switchboard; personnel extension 26-62; vocational training center extension 20-31 and 20-32. The address is the following:

Energetika Corporation, eighth floor, room No 813, No 8 Triyaditsa Street, Sofia. Telephone No 87-00-19 or 86-191, extension 273.

5003
CSO: 2200/24

SCIENTISTS ISSUE APPEAL AGAINST NUCLEAR DANGER

AU302150 Sofia BTA in English 1819 GMT 30 Oct 84

[Text] Sofia, 30 Oct (BTA)--Bulgarian scientists have come up with an appeal to scientists and cultural functionaries worldwide to join their efforts in the struggle against the threat of a nuclear catastrophe.

"The threatening escalation of tensions among the states in the world, now further aggravated by the deployment and the numerical increase of the new U.S. nuclear missiles in certain West European countries and by the "space wars" defence program of U.S. President Reagan, poses a threat to the life of the inhabitants of the European Continent which is the most densely populated one and with the greatest wealth of historical and cultural monuments," says the document, unanimously adopted today at the ceremonial meeting in Sofia on the occasion of the 40th foundation anniversary of the Union of Scientific Workers in Bulgaria. "If mankind would not prevent another world war, it is inevitably bound to escalate into a nuclear war and all our plans, dreams and ideals for better life, for progress in science and technology, for the flourishing of the arts and culture, will come to nothing. That is why we scientific workers want to do our duty--to be the first to elucidate, in a systematic and competent manner, the implications of a modern war and of its consequences. We scientific workers must convince people that war is not inevitable, that there is a way out. The voice of reason, the voice of peace, of friendship among people must prevail over the din of militarism."

"Scientists must necessarily contribute to setting up of an atmosphere in which the very uttering of the word 'war' would become inadmissible, incompatible with people's morals," the appeal emphasises. "Science makes it possible for the earth to meet the needs of many more billions of inhabitants. And besides, there are the oceans, the earth's bowels, there is outer space. Let us direct our creative endeavours and pursuits to these new territories. Let us close up our ranks in the struggle for peace. The World Federation of Scientific Workers and the World Peace Council, as well as all scientific, cultural, economic, trading, sport and other international organizations must carry their peace-loving activities even further," Bulgarian scientists say in their appeal.

CSO: 5100/3003

GERMAN SALE OF TECHNOLOGY FOR HUNGARIAN NUCLEAR POWER PLANT

Paris NUCLELEC in French 11 Oct 84 p 11

[Text] As reported by ASPEA (Swiss Association for Nuclear Energy) in its September bulletin, quoting information received from KWU, a "first" is taking place in the eastern block countries in the nuclear field, namely, that the three 440 MW VVER sections of the Hungarian nuclear power plant at Paks, which is currently under construction, will be equipped with high density storage units for irradiated fuel elements, units that use the technique of the German Kraftwerk Union.

The order, which was given to KWU before the summer, covers the design, construction, and delivery of raw materials. The mountings of the units will be manufactured in Hungary according to plans supplied by KWU.

For the second section of Paks, which is being completed, the installation of the equipment will occur before the first fuel change in June 1985, with about one year's delay for Paks 3 and 4.

No decision has been taken about the installation of high density units in Paks 1, which has been in service since 1983.

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CSO: 5100/3001

JUSTICIALIST DEPUTY ADVOCATES ADHERENCE TO NUCLEAR PLAN

Buenos Aires ENERGEIA in Spanish No 47/48, Aug 84 p 8

[Article by Mario Gurioli, Justicialist national deputy for Buenos Aires Province and vice chairman of the Science and Technology Committee of the Chamber of Deputies: "There Was No Debate on Nuclear Energy"]

[Text] The return of the Argentines to democratic life instantly implied the formation of a new state of public opinion. The phenomenon was obvious in the sector of nuclear policy. This matter was given space in all the media and different voices were heard supporting or condemning our nuclear development, precisely at a time when the international media were especially sensitive because of the announcement made by the then head of the CNEA [National Commission for Atomic Energy], Vice Admiral Castro Madero, last 18 November referring to our country's access to uranium enrichment.

But there was no debate. There were only arguments not confronted and often lacking a basis of objective information. The Justicialist bloc took a pro-nuclear position through some deputies whose opinion filled an obvious vacuum at the precise time when pressures redoubled on the UCR [Radical Civic Union] government to achieve rapid correction of the path followed traditionally by our nuclear diplomacy.

National nuclear development, continued for more than three decades with difficult consistency because of Argentine politics, was quickly subjected to a scissors operation that tried to freeze it where it was. On one side was the international pressure to which I recently alluded and on the other side were the native antinuclear expressions--antitechnological is more correct--that spread the ecological terrors that await countries that opt for nuclear energy as a lever for development to benefit the central countries.

Facing this situation, it was inevitable that the Justicialist Party would adopt a firm and determined position in defense of the Nuclear Plan. There was not only an emotional commitment since it was General Peron who promoted the origin of our development in this field around 1950 but also we Peronists are fully convinced of the strategic value of the work of the CNEA. It is not limited strictly to energy since it is projected backward and forward in basic research, medicinal uses, the irradiation of foods and fusion, plasma physics and laser research.

It is alleged that nuclear energy is in retreat everywhere. That is not true. The 1983 figures indicate the opposite: with 8 percent of the total installed capacity, nuclear powerplants produced 12 percent of the world electricity. Although in some countries the nuclear industry is going through difficult times--notably in the United States--in others, it maintains its original dynamism. Let us look at France where almost half the electricity comes from nuclear powerplants or Belgium where that proportion is 46 percent. Japan has already planned eight sites to install offshore nuclear plants.

It is a matter of spreading rumors about alleged military intentions that underlie Argentine development in this field. In reality, the question focuses on the control of the nuclear international market in which Argentina has already made its appearance. At the same time, it is an attempt to obscure the importance that our nuclear development can achieve in the regional framework where the CNEA has concluded agreements that demonstrate the proclaimed South-South cooperation and Ibero-American unity.

Without knowing the statistics or in bad faith, it is preached that nuclear energy is more expensive. Despite such comments, Atucha I continues to be the cheapest machine in the Interconnected System and Embalse, in spite of being in its first year in operation, already generates at a competitive cost with hydroelectric plants.

All the potential of our nuclear park has still not been used because the nuclear powerplants are used as an adjustment variable for what Salta Grande cannot deliver due to lack of hydraulic power.

In spite of everything, we feel that the hardest fight is over. This does not mean that we should lower our guard because there are constant risks for our Nuclear Plan. Quite the contrary, we continue on guard facing the impact that the budget cuts suggested by the Secretariat of Finance could eventually have and facing the need to maintain the national nuclear industry because of that cooperation which we mentioned. To achieve this objective, it is necessary to insist that the terms set forth in the Nuclear Plan remain in effect. This means the construction of three nuclear powerplants before the year 2000 which would be added to the two in operation and one under construction now.

An interesting topic for debate--this time serious, responsible and authorized--is the fourth nuclear powerplant since the possibility of undertaking this project on the basis of a module smaller than the one originally planned has been divulged recently. A 300-megawatt reactor can facilitate Argentina's nuclear presence in Latin America. At the same time, obviously, it has special interest for electrical planning because of the greater flexibility it permits. Perhaps there can be constructive dialogue on this point between the authorities of the sector and the rest of the participants in the community involved in it (legislators, businessmen, workers, consumers) that will lead to broader national agreements.

Argentine sovereignty in the 21st century can only be based on domination of the techniques of nuclear fission and fusion, robotics, information, lasers and plasma. If we renounce this and limit ourselves to producing grain, we will be a colony and one of the least prosperous at that. Also our population will be 50 percent too large just as Martinez de Hoz wanted.

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CSO: 5100/2015

YRIART POINTS TO LOOPHOLES IN CNEA RESTRUCTURING PLANS

Buenos Aires ENERGEIA in Spanish No 47/48, Aug 84 pp 17-19

[Article by Martin F. Yriart: "Incomplete Organizational Chart for Nuclear Energy"]

[Text] If for a minute we ignore the current crisis the national economy is going through as a consequence of the greater crisis it is affected by and discount the effects of the political transition, accepting the UCR [Radical Civic Union] government's statements of intention, it will be seen that the Argentine nuclear sector is in a natural stage of transition. Many changes will have to take place before it reaches maturity and is stabilized in a more or less definitive structure. I say more or less because the forces of technological change are so powerful within the sector that they, by necessity, cause structural changes in relatively short periods of time.

Rewrite the Script

The measures that are proposed now, however, are aimed at the past rather than the future. They seem to be an attempt to rewrite what has already been written, fix problems, unify scattered parts and adapt a relatively authoritarian model to a more democratic one.

One of the reforms that is already known is the establishment of a directorate in the CNEA [National Commission for Atomic Energy] made up of career officials and officials from outside the institution. (This would tend to place it better in the government scaffolding.) Another is the elevation of the area of radiological protection and nuclear security, including the licensing of people and installations and the ecological problem, to a status of semi-independence with an official appointed directly by the president of the country. (This would strengthen safety for the workers, the population and the environment.) Also a permanent system of parliamentary supervision will be set up. (This would have the objective of politically guaranteeing the exclusively peaceful use of nuclear energy in the country and discouraging arms adventures.)

The effectiveness and appropriateness of all these measures have been widely discussed already. Since they will surely be put into practice or at least approved soon, it is hoped that they provide all the positive results their advocates claim.

In the Short Term

However, if the Argentine nuclear sector is to continue evolving toward its scientific, technological, industrial and economic maturity, there are still many blank pigeonholes in the structure. There are three at least that must be filled in quickly: the plants for special alloys and circalloy pipes; conversion to uranium dioxide; and industrial production of heavy water. Each of these three operations is typically commercial and should be assigned to other enterprises, following the acceptable example of the Combustible Elements Factory of Ezeiza. This is operated by the CNEA through the mixed enterprise CONUAR [Argentine Nuclear Fuel Corporation, Inc.] in which CNEA is a minority shareholder but reserves some critical decisions.

The three cases mentioned should be able to follow the steps of the FAE [expansion unknown] with relative ease since the first two plants are already in operating condition and it is feasible to establish their profitability. The last is usually an industrial plant which has a known process so it should not be difficult. The only question about the PIAP [expansion unknown] is its market since its capacity is set up for a plan that included the installation of at least one nuclear powerplant of 700 megawatts every 4 or 5 years until the end of the century.

Pending Case

A fourth sector in which more or less definitive structural solutions are pending is extraction of uranium and production of concentrate. This is also typically a commercial operation but efforts undertaken in the past to transfer it to the private sector and attract foreign enterprises that have technology and experience have not yielded results. This is ascribed to the international situation of the uranium market which discourages the enterprises that participate in it from making new investments or reserves in Argentina in a closed market dominated by a single buyer, the state. The incentive permitting exports of a percentage of the production has not been effective in a depressed international market where Argentine uranium must compete with uranium from more profitable deposits.

These projects have already been the subject of some discussion and are set within known formulas. However, there are three others that either have not been analyzed at all or are still very much at the preliminary stage.

Nuclear Powerplants

The topic of the development of nuclear powerplants belongs to this last category. Both the UCR and the Justicialist Party included different initiatives in their electoral platform to unify the electrical industry under a single entity that would also absorb the nuclear powerplants.

The proposal was criticized by the CNEA for several reasons. In the present stage of scientific-technological nuclear development, the construction and operation of powerplants is still part of the process of transfer and development of technology and human resources. It would lead to the break up of very

skilled teams and their partial duplication. It would make feedback difficult in the key sector of radiological protection and safety. Finally, it would break up the leadership of nuclear development of the country, weakening it, and would deprive the CNEA of a return on its economic and human investment of three decades. This would be directly translated into a loss for the country.

After TMI

There are also other observations more specifically related to the question of the installation and secure operation of nuclear powerplants that have arisen in recent years, especially after the Three Mile Island accident and the innumerable technical snags suffered by different nuclear powerplant projects in the United States.

The installation and operation of nuclear powerplants requires a level of specialization and a system of control and security for which conventional electrical enterprises are not prepared. Grafting nuclear powerplants onto conventional powerplant structures tends to cause problems due to their different work modalities. In the U.S. electrical sector today, there is a trend away from this unmanageable situation toward future specialized enterprises to operate nuclear powerplants.

An analogous solution could benefit our country. It would not be hard to conceive of a mixed enterprise made up of the CNEA and one or more national electrical enterprises (Water and Energy, EPEC [expansion unknown], DEBA [Buenos Aires Electric Power Administration], etc.) to operate its own nuclear powerplants or a third party's. Through the participation of the CNEA, all the current benefits of the integration of the nuclear cycle in a single structure would be retained with the added experience, capital and better sectorial coordination from the participation of the energy enterprises. This would also contribute to the horizontal transfer of technology from the more sophisticated nuclear sector to the conventional sectors which would thus obtain an additional benefit.

Nuclear Trade

Another little square in the structure that is still blank is Argentine participation in international nuclear trade. Although our country is a major importer of nuclear technology, supplies and equipment, it has exportable uranium resources and can offer internationally current technologies like enrichment, reprocessing, final disposition, etc. It can also export experimental reactors and participate, through our engineering and our products, in powerplant projects abroad. Despite all this, we still buy on the world market like someone who goes to the corner drugstore to buy a box of Bandaids and we sell with the bashfulness and timidity with which a school raffle ticket is offered to a close relative.

Ghost of the IAPI [expansion unknown], go back to your grave! There is nothing further from this idea than the creation of a new parasitic bureaucracy that monopolizes operations, distorting the objective. The IAPI fulfilled the function of forcing the agricultural-livestock sector to share the proceeds from

its exports with the state and other sectors of the economy. We are talking about maximizing the value of international trade exchange in the nuclear sector as it approaches a level of economic maturity, a little like the Japanese trading companies and their like that have proliferated throughout the world. Here we could very easily conceive of an enterprise made up by the main state and private enterprises of the sector and the CNEA itself. By participating in the international market, it can help compensate for domestic production cycles (buying and selling uranium, heavy water, zirconium, etc., for domestic or foreign projects in the current and futures market) and, in general, represent the sector commercially and financially, obtaining the benefits of group acquisition and the endorsement of all the associated capital.

Dance with the Wallflower

The last rectangle on the nuclear organizational chart that I want to consider here is only tangentially concerned with the economic aspects of the development of the sector although its participation can be significant. It involves the military aspects--banned and not banned--of the use of nuclear energy. The topic is in itself repulsive, to many a taboo. There are respectable people in the sector who would like this never to be mentioned in public, much less on the same page with peaceful uses.

However, acting like an ostrich does not always yield results. At some point, it is necessary to dance with the wallflower, as the saying goes. In a country that has suffered bomb paranoia to some degree, it would not be bad to make things clear once and for all.

Four things must be considered. 1) On the international political plane, peaceful uses and military uses are perversely intertwined and it is naive to ignore this. 2) On the scientific-technological plane, both depend on the same scientific-technological base and the same know-how. 3) Many legal military developments (compact reactors for ship propulsion, for example) are applicable to current or future civilian uses. 4) Even when Argentina renounces /all/ [in boldface] military use of nuclear energy, it should still actively prepare itself for defense in case of nuclear attack. This preparation that, of course, must also be political and not just technical requires knowledge not only of the effects of nuclear weapons but a knowledge of the weapons themselves in order to be able to determine that.

Civilian Government and AAFF

The responsibility for these problems is, first of all, political and rests in the constitutional authorities (the president of the country, the Congress, etc.). The specific implementers would have to be the FFAA [Armed Forces]. Any direct intervention by the FFAA in a nuclear program, however--even the most innocuous--would give way to the usual alarm, both outside and inside the country. Following models applied in the United States, the FRG, France, Great Britain, etc., it is not out of place to propose a /civilian/ [in boldface] authority under direct supervision of the political government to assume the specific tasks of research and development, attraction of available material and human resources from the different areas of the public and private sector

(top in excellence and low in availability) and provision of the necessary services of advice, support, training of human resources, supplies, publicity, civil defense, etc.

A top officer retired from the FFAA said some time ago in an informal talk: "They cannot keep us from making a bomb because if they prohibit it, we will do it--as is said in our language--'under the bed.'" The hypothesis that the Argentine military would make such a serious decision behind the back of the country is unthinkable. It is not a matter of "keeping the bomb from the military" but of placing the military uses of nuclear energy in their place--the political government--and implementation where there is no room for misunderstandings--in the scientific-technological sector.

It is hard for the new Argentine nuclear legislation to include all these aspects of nuclear development of our country but sooner or later decisions will have to be made on them.

Budget

If the budget granted to the CNEA for 1984 and the procedure for establishing it is considered an omen of what awaits the Argentine nuclear sector from the UCR government, many people can start to order their mourning clothes and others to seek work elsewhere.

The statements by President Alfonsin are not consistent with the cut in the CNEA budget--an unimportant cut both for balancing the budget as well as for containing the foreign debt. However, neither is the treatment it has received from the National Treasury. In the first 6 months of the year, the CNEA received 579 million pesos from it--that is, 3.4 percent of what the Treasury had promised to supply it for the entire year. This means that from 1 July to 31 December, it will have to disburse the remaining 96.4 percent which top officials of the CNEA have already discarded as impossible. One of them stated: "If they do give it to us, we will not have time to use it."

The two charts differ in some figures but coincide in reality. Chart 1 represents the distribution of the planned expenses by the CNEA based on its different programs. The figure established for 1984 is 21,949,610,000 Argentine pesos. It should be recalled that it totaled 13,610,300,000 in 1983 at average values for that year and in 1982 it totaled 33,000,143,000 in 1982 pesos. The shrinkage, after adjustments for inflation and the change in currency, is drastic.

The other chart shows the existing trend in budget policy (Chart 2) since the figure agreed on represents an increase of 33.6 percent in interest to be paid during the fiscal year and a reduction in debt amortization of less than 1 percent.

Draft 1984 Budget

In thousands of pesos, December 1984; written 18 July 1984; does not include Clause 11 (Personnel)

Program/Clauses	12	41	42	91	Total
I. Installation of nuclear powerplants	1,746,660	15,079	5,830,897	203,126	7,803,762
II. Radioisotopes and radiation	148,475	8,190	64,696	-------	221,361
III. Research and development	234,253	51,103	1,478,698	2,310	1,766,364
IV. Protection and safety	26,370	2,312	56,385	-------	85,067
V. Leadership, training and support	1,029,213	40,195	115,040	2,310	1,186,758
VI. Supplies to nuclear powerplants	607,358	3,088	4,489,844	2,066	5,102,356
Total Clauses	3,792,329	119,967	12,043,560	209,812	16,165,668

Total Clause 21: Debt interest	4,890,964
Total Clause 81: Debt amortization	842,110
Total Clause 31: Transfers to finance current disbursements (scholarships)	24,546
Total Clauses 51, 61, 71, 72	26,352
Total Clauses 21, 81, 31, 51, 61, 71, 72	5,783,972
General Total	21,949,610

References:

Clause 11: Personnel
Clause 12: Goods and nonpersonnel services
Clause 41: Equipment (Real Investment I)
Clause 42: Construction (Real Investment II, includes beginning equipment)
Clause 91: Advances to suppliers and contractors
Clause 21: Debt interest
Clause 81: Debt amortization
Clause 31: Transfers to finance current disbursements
Clause 51: Preexisting assets (acquisition of land or buildings)
Clause 61: Capital contributions
Clause 71-72: Figurative disbursements

1984 Budget

In thousands of pesos, according to data supplied by the Energy Commission of the Chamber of Deputies published on 27 July 1978 [as published] by TIEMPO ARGENTINO

Expenses	Requested	Offered	Agreed
Personnel and current expenses	5,037.8	4,737.8	4,737.8
Real investment	15,356.0	12,056.0	10,574.1
Advances to suppliers	209.8	209.8	209.8
Other disbursements	52.3	52.3	52.3
Interest	3,661.6	4,890.9	4,890.9
Amortization	13,279.1	842.0	842.0
Total expenses	37,596.6	22,788.8	21,306.9
Resources			
National Treasury	33,521.8	18,314.1	16,832.1
Specific resources	2,513.9	2,931.9	2,931.9
Use of credit	1,333.3	1,333.3	1,333.3
Other	209.6	209.6	209.6
Total resources	37,590.6	22,788.8	21,307.0

7717
CSO: 5100/2015

FOREIGN RELATIONS SECRETARY ON CNEA'S BUDGET PROBLEMS

Buenos Aires CLARIN in Spanish 22 Sep 84 p 10

[Interview with Jorge Federico Sabato, secretary of foreign relations]

[Text] Question: What is Argentina's nuclear policy now?

Answer: There are four points that summarize Argentina's nuclear policy. The first: to have a nuclear technology capability; this means, of course, technology that is not readily available in a conventional commercial form throughout the world; it carries no price tag. For that reason, the availability of a technological capability is an essential condition. The second point is to have a nuclear industrial capacity.

Energy demand doubles approximately every 10 years: that is the historic trend in countries with our type of development, though in recent years we have not reached those figures. In any case, in 1980 we had an industrial capacity of 10,000 MW; toward 1990, we will need 20,000 MW; 40,000 MW by the year 2000; 80,000 MW by 2010; and 160,000 by 2020. Now: the overall final capacity of the hydroelectric potential we have in Argentina is 35,000 MW.

This means that at some point between 2010 and 2020, we are going to have a shortfall in our energy supply in relation to our hydroelectric capacity of about 50,000 or even 60,000 MW; this deficit would probably have to be met by nuclear energy. So, unless other energy alternatives arise, or unless the electricity demand curves drastically change, we would need to have a major construction program for nuclear power plants.

Question: Our peak hydroelectric power capacity is 35,000 MW?

Answer: That is our theoretical peak, using all the waterfalls we have in Argentina.

Question: Now I would like to discuss with you the relation between this "nuclear industrial capacity" and the rest of our national industry.

Answer: You are referring to the transforming capacity of the nuclear industry. There is a certain similarity with what the railroad did during the 19th century; not only did it require locomotives and rails; it produced a formidable development in steel and mining, plus all the technology that it created. This means that the development of the nuclear industry has stimulating and transforming effects on the entire system of production.

Question: Then there will be a driving force on the economy, as the railroad was?

Answer: It will bring about changes, but it will not dynamize the economy. It will create new applications. If you make a very special compressor that moves you ahead in the field of compressor technology, that can be applied to an enormous range of other activities.

Question: What are the two other points that make up Argentina's nuclear policy?

Answer: Not to manufacture nuclear weapons, and to use our nuclear capability for peaceful purposes. Obviously, these are interrelated objectives.

Question: Now, how are you going to stimulate our nuclear industrial capacity? This question is a timely one, because the budget allocation for nuclear energy implies a delay in the construction of atomic facilities. Specifically, Arroyito (heavy water), Atucha II, and the Ezeiza reprocessing plant.

Answer: Before getting into that, let me repeat that the dimension of the Argentine plan is conservative and reasonable: the idea is to have about six power plants in operation between the year 2000 and 2010, with an installed capacity of 3,500 MW; so at that time, we would have 12 percent of the installed power we would probably need.

Question: Then what are the priorities in energy now?

Answer: The center of gravity of our energy investments is going to shift toward hydroelectric projects, and nuclear power plants are to supplement hydroelectric power. This means that we are not embarking on a massive construction program, but

rather that we are developing the necessary technological and industrial capacity so that, 10 years from now, we can start on massive production. That is the idea: it is not a matter of shifting all the weight at this moment toward the nuclear industry.

Question: Okay. That's for the long term. But for the short term, what is happening with the nuclear energy budget?

Answer: We have had to give serious thought to that. Between 1978 and 1981 we lived in a time of cheap dollars. It cost less to vacation in Tahiti than in Necochea. The same thing was also true with investments. But times have changed. Now it costs us five times what it cost us 5 years ago in relation to Argentina's investment capacity. In the case of atomic energy, the situation has been more reasonable, but still there can be no doubt at all that the overall investment plan was oversized. If priorities had been based on an expensive dollar and on a cheap dollar, today we would have a much greater ability to pursue investments. Now we have to scale down those investments and perhaps some projects that would have had great priority may have to suffer...

Question: Precisely. In delaying those three projects I mentioned to you earlier, due to the existence of penalty clauses in the contract, there will be fines to pay. Because of that, won't we lose what we were trying to save by postponing those projects?

Answer: Of course it will be more expensive, but the problem is that we don't have the money to pay for the construction.

Question: It's also a problem of funding allocations...

Answer: Tell me one thing: we now need to invest in hospitals, in schools, etc. It isn't possible to say: "All that is secondary; we are going to let things continue just as they were in the past." That simply isn't possible. It isn't possible politically or socially.

Question: But is that really true? You spoke of the nuclear industry as spurring on progress throughout the entire system of production. I would add to that the fact that it is the only industry that will bring us Argentines into the 21st century, and perhaps the only one that will enable us to join in the "industrial revolution" that is now taking place in the world.

Perhaps if we allocate resources to the nuclear industry intelligently, and force ourselves to make restrictions in some areas of public spending, in the future there may be more money available for social spending. If not, we will have to settle for being what we are today.

Answer: Well, in theory all that is true, and we could discuss it at great length. I would like to know what the deterioration in education in Argentina is going to cost us; and how much the decline in our health care system is going to cost us. It may take us a generation to put back together an educational system that was without any doubt whatsoever the best in Latin America, and which is in very poor shape today.

Question: I want to ask you one thing. How are we going to guarantee the development of our nuclear industry in such conditions of austerity?

Answer: Certainly we can't sacrifice the construction of our power plants; we can postpone them a little, but we are going to go ahead with the nuclear power plants program because it is important and necessary. Remember that the biggest problems don't come so much from the budget cuts as from the treasury flows that are also linked to the problem of inflation. I have no doubt but that the Atomic Energy Commission is going to have to be much more careful about its system of allocating investments than it was 5 or 6 years ago. And that isn't a problem of competence or a matter of a change in policy, but simply a change in context.

Question: I have heard that the nuclear bill now being drafted keeps the current structure of the National ATomic Energy Commission; everything converges in it: research, energy production, etc.

Answer: Just like the budget, that is what we have; we can't invent a reality different from what already exists. In any event, we are concerned that the Commission should have what it needs to work and to make compatible activities of different types.

Question: I have also heard that the bill establishes an accounting and control authority, charging it with maintaining a registry of the supplies of radioactive materials, and another authority to deal with matters related to nuclear plant safety. Both authorities are proposed by the CNEA to the executive authority. Aren't you afraid that Congress is trying to become involved in this?

Answer: Congress already has the power to request inspections, as well as many other powers, aside from what that bill may provide. Now, making either of those authorities dependent on Congress would be neither functional nor productive.

7679
CSO: 5100/2006

GOVERNMENT VIEWED AS 'UNSYMPATHETIC' TO NUCLEAR MATTERS

Bahia Blanca LA NUEVA PROVINCIA in Spanish 23 Sep 84 p 6

[Editorial]

[Text] If until the very recent past there did exist within our generally gloomy national panorama one truly and clearly successful state activity, it was the work done by the CNEA [National Atomic Energy Commission]. Obviously, this is not a more or less indifferent activity, but one that is vital for Argentina's future from every point of view. Atomic energy, aside from its not at all negligible strategic applications, is one of the keys to the 21st century. Sometime in the next century when the traditional energy sources have been exhausted, the dominion of the atom and the existence of suitable scientific equipment and staff, operating on a well prepared infrastructure, will be a guarantee of survival and development for the nation that possesses them.

Now that we have mentioned the CNEA's successes, we can do no less than point out two factors that were the reasons behind this success: continuity and a desire for independence. The first preserved the staff of the Commission from the disruptive political influences of changing governments and kept it firmly committed to its technical mission. The second factor made it possible for Argentina to continue its nuclear program free from any subjection to outside regulatory influences. When attempts were made to apply pressures, Argentina was quite free to seek the necessary suppliers wherever it could find them. And so, ever since the Falklands War, right in the middle of the last military government's total political disintegration, the CNEA's then director, Admiral Castro Madero, was able to announce that--at least on one front--Argentina still ranked among the world's leading nations.

Now, it might be said that the current administration does not sympathize with atomic energy, since in its election platform its position on the Tlatelolco Treaty and the Nuclear Non-Proliferation Treaty was not made sufficiently clear, but--at least--that platform did not condemn nuclear development for peaceful purposes. Nonetheless, this lack of sympathy that we just pointed out--and whose ideological or psychological roots should be explored some time--evidently affects nuclear energy in all its forms. "To split up the atom splitters" was their rather strange slogan. Perhaps there are some petit-bourgeois sentimentalists who imagine the atom to be something like a lovable hamster--a plump, lively little animal--and think it should be protected from any aggressors trying to split it up, even for peaceful purposes.

For the same thing has happened with the CNEA budget as happens when you count the "ten little Indians" or "ten little piggies": one fell down, another got lost, another ran home... until there were none. In December 1984 [sic], according to the press, a budget was prepared for the Commission of about 29 billion pesos. At the government's request, the CNEA cut its budget to 20 billion, but the department of finance then cut it to 17 billion. Nonetheless, the budget appropriations bill sent to Congress allocates just a little over 15 billion to the CNEA. And despite that, as of June it was authorized to receive just a little more than 3.3 billion, of which it seems to have received only about 1.2 billion to date.

This has repercussions on a variety of fronts. Above all, it has an impact on the contracts the CNEA has signed with private companies which subcontract work from the CNEA. The debt is rising to an astronomical level and unproductive costs are growing day by day. While construction projects remain paralyzed, the state debt grows. Finally, there are even some plans for the removal of some of these companies from this program; that will certainly give rise to expensive compensations for breaking contracts, and will mean new and major delays for Atucha II. The heated political debate on this issue between the Justicialist legislators and the man presumed to be responsible for the budget strangulation, the secretary of finance, Norberto Bertaina, is just one more aspect of this. It also includes the prospect of new crises in the CNEA leadership (perhaps the replacement of its chairman, engineer Costantini), and the emigration--once again-- of highly skilled technical specialists.

This prospect is indeed a distressing one. And the Radical government's responsibility in this regard is very serious.

If the National Atomic Energy Commission--which has both served the nation and maintained its effectiveness under all regimes--were dismantled or diminished to a level of insignificance because of budgetary decisions made by the current administration, the damage would be irreparable, the fault without any possible redemption. And when the time came to render accounts to history, no one, either from the left or from the right, and none of the hopeful voters of October, would ever forget that.

7679
CSO: 5100/2006

NUCLEAR PROGRAM: PAKISTANI FACTOR ANALYZED

BK211348 New Delhi NATIONAL HERALD in English 14 Oct 84 p 7

[Article entitled "India's Nuclear Policy and Pakistan" by Brij Mohan Kaushik]

[Text] Nuclear debate in India started in the wake of Chinese detonation of an atomic device in October 1964. Coming as it did close on India's humiliating defeat in 1962, the Chinese bomb was an understandable point of reference for this debate.

Only about a decade earlier, Zhou Enlai had commended India's nuclear programme and admitted that India was much ahead of China in nuclear research. Soon after Chinese entry into the nuclear club. India succeeded in operating a small (pilot) reprocessing plant at Trombay. Homi Bhabha could claim that the Indian atomic establishment was capable of making nuclear weapons within 18 months of political decision to do so. He was not wide off the mark. However Bhabha's statement coupled with India's opposition to non-proliferation treaty then under negotiations prompted Zulifikar Ali Bhutto to state that Pakistanis would eat leaves and grass but make the bomb, should India go nuclear. The Pakistani connection with India's nuclear decision making had thus started.

Developments since then have taken a full circle. One looks askance at efforts of those compatriots who are playing into the hands of Pakistan by trying to compete with Pakistani efforts to make nuclear weapons. Nothing suits Pakistan better than this. By including the Indian elite to urge the Government of India to make nuclear weapons because Pakistan has either made them or is about to make them. Pakistan has already won the game. It is not the Pakistani elite but the Indian elite which is now equating India with Pakistan. The Pakistani nuclear bluff has been made out to be the real danger for India's security without taking into consideration consequences of such an innocent-looking act. Even before Pakistan could make its bomb--which undoubtedly it is endeavouring to make--some people in this country have produced one which "we cannot ignore."

Why this renewed interest in India about imminence of the Pakistani bomb, maybe Islamic bomb? Those who had predicted in 1979-80 that the Pakistani bomb was around the corner had been disappointed by tardy progress made by the miracle man, A.Q. Khan, who was presumed by them to be able to do a quick

job of this difficult technical task. They were heartened to see the publication of A.Q. Khan's first interview in NAWAI WAQT in February 1984. It was followed by publication of articles by Sajjad Hyder and F. Hassan in Pakistani media. Soon after came the address by U.S. Senator Alan Cranston delivered on Senate floor on June 21, 1984. All these have since been widely circulated in this country by reproducing them in toto in newspapers. Even a pirated Indian edition of the first Pakistani book on the subject (by Akhtar Ali) exists.

However, one need not be swayed by these evidences for two reasons. First, the Pakistani effort to provide it with nuclear deterrance without actually possessing one, (nuclear bluff), and secondly, Western anti-proliferation lobby which has been making wild scenarios of a world-wide spread of nuclear weapons since early 1960's--scenarios that have not come true after two decades. The hand of the Zionist lobby also cannot be ruled out.

In his interview to NAWAI WAQT, A.Q. Khan maintains: "Pakistan is now among those few countries which have acquired mastery over uranium enrichment." While talking about Pakistan's capability to make nuclear weapons, he asserts "We would not disappoint the country and nation if the President were to take this extreme step for safety and security of the country, and the job is entrusted to us." This reminds us of what Homi Bhabha said in 1965. If A.Q. Khan has been able to achieve a breakthrough in uranium enrichment technology as admitted by him, he can certainly boast of carrying Pakistan to the nuclear threshold as Bhabha did in 1965 after commissioning the small reprocessing plant at Trombay.

The claim made by F. Hassan that Pakistan has uranium enrichment capacity is doubtful in view of technological and industrial constraints on Pakistan in developing this sophisticated technology. Surely, not enough hard data is available on this aspect of the problem but it is dangerous to opt for the scenario. Even while going the whole hog with what A.Q. Khan, Sajjad Hyder, F. Hassan and Akhtar Ali have said, one is not sure whether all this is not meant for specifically providing Pakistan the posture of "ambivalence" in the nuclear field. For, there is not much difference between the nuclear "bluff" and the "ambivalent" posture.

We need to have a hard look at what Senator Cranston discovered. According to him, he has "no evidence that Pakistan has actual nuclear bombs in hand, or that Pakistan has already produced specific amount of weapons-grade material." But he maintains that Pakistan "could produce at least a dozen nuclear weapons during next three to five years if their facilities function smoothly." However, his findings seem to be inconsistent with his conclusions. For instance, he maintains that "there is substantial evidence that Pakistan has developed all of these capabilities (intellectual resources, money, production capacity, design team and delivery capability) including both uranium enrichment and plutonium recovery."

Cranston maintains that "by 1983 they had completed 1,000 units--enough to produce at least 15 kg of weapons-grade highly enriched uranium (HEU) a year.

The Kahuta plant is estimated to have current capacity of 2,000 to 3,000 SWU (separative work units). This is enough capacity to produce 45 kg of HEU.

Cranston tells us that clandestine Pakistani purchases of equipment have been "accelerated over past 12 months and are being sent both to Kahuta and to a new underground site in Multan (for manufacturing HEU)." What is the necessity for Pakistan to build a new plant if Kahuta plant is already working and is being expanded? Centrifuge plants can be easily expanded. The message is clear in Cranston's address when he says that these developments (Kahuta expansion and establishment of a new enrichment plants of 6,000 to 8,000 SWU at Multan) would not have taken place "if Kahuta R and D Project had not succeeded in producing weapons-usuable uranium." So, Kahuta project is a research project (a pilot plant, a demonstration plant) whose success has led Pakistan to go in for a bigger uranium enrichment plant in Multan. If this is so, Pakistan as of today does not possess enough HEU for a bomb.

Cranston further tells us that "Pakistanis already have a significant stock-pile of aluminium centrifuges--ideal for production of weapons-grade material but of less utility for energy production. [no closing quote mark published] "This is not clear should centrifuges for producing weapons-grade enriched uranium rotate at a lower speed than the ones producing industrial-grade enriched uranium? [sentence as published]

On the question of preparing a test site in Baluchistan mountains in early 1981, he maintains that "this effort may have been a bluff, pressed by Zia in a cat-and-mouse game with Indians who were simultaneously digging large holes at their Pokharan test site amidst high security." There is no evidence at all that India was doing any such thing.

Cranston is afraid of increased danger "that extremist forces may employ nuclear threats in a 'holy war' against India, Israel or some other nation." According to him the Pakistani bomb "raises prospect of a pre-emptive strike against Pakistan's nuclear facilities. Responsible sources have reported that serious consideration has been given to a strike against Pakistani nuclear facilities. Many Indians perceive this to be the only alternative to a major nuclear weapons programme of their own." How many Indians have talked of this alternative? Does a section of Americans want India to indulge in such an undesirable act? How far does one go with Cranston's thesis of the imminence of a nuclear Pakistan?

It is high time one takes a realistic view of developments in Pakistan. This is no way bars those who want India to make nuclear weapons to stop advocating such a course. There are several reasons why India should go nuclear--the additional argument of an imminent Pakistani bomb is really not needed. Pakistan has still not crossed the threshold. There is still time for us to act as to inhabit nuclear arms race on the subcontinent if India remains wedded to "no bomb" policy as it has professed so far. Can we take some positive initiative in this direction? The South Asian Regional Cooperation (SARC) seems to be the ideal choice for an Indian initiative in this regard. If bilateral nuclear cooperation between India and Pakistan or other relevant proposal in this regard like the mutual inspection of each other's nuclear facilities are not acceptable to parties concerned.

CSO: 5100/4706

CONSTRUCTION OF ESFAHAN NUCLEAR REACTOR ELABORATED

Tehran ETTELA'AT in Persian 11 Oct 84 p 4

[Interview with director of Esfahan center for nuclear technology; interviewer, date and place not specified]

[Text] The design of a "zero power" reactor will begin next year.

Esfahan. The construction of a "sub critical" reactor by the committed experts of the center for nuclear technology of Esfahan is underway and will be operational by the end of this year.

In an interview, the director of the Esfahan center for nuclear technology pointed out that all the planning and implementary programs of this reactor, which is extremely important to nuclear technology, is being carried out by the experts of our country in this center. He said: The research is carried out by committed Iranian experts.

He also said: In the five- or seven-year plan of this center, a zero power reactor will be built. The preliminary stages and calculations for this reactor are underway and according to plans carried out, the designing will begin next year.

Pointing out that the Esfahan technology center has rendered services to various industrial sectors in order to move towards the industrial self-sufficiency of the country, in regards to the history and motives behind the creation of the center, Dr Qannadi said: In order to offer research services to the atomic energy stations of this planning center, before the victory of the Islamic revolution, a contract was signed with the atomic technology company of France, during the period 21 March 1975-20 March 1976. Only the design for the second phase of the above-mentioned project was carried out by that company. However, after the victory of the Islamic revolution, considering the suspension of the colonialist plans for the atomic energy station, the activities of the nuclear technology center were reviewed. At the present time, its completion and operation are

being carried out by about 100 persons in the main cadre, who are highly specialized and have science degrees.

Pointing out that all the parts needed in various sections are manufactured in the workshops of the center, Dr Qannadi said: Also, through our efforts we have been able to produce and operate a variety of machinery to serve other sections which were previously imported at high prices. Since the important goal of the existing plans in the center for nuclear technology is to achieve industrial self-sufficiency, considering our work after the victory of the Islamic revolution, we hope to witness significant progress in this area in the next few years.

In conclusion, concerning the welfare of the experts in this center, the director of the Esfahan center for nuclear technology said: At a cost of about 500 million rials, 90 residential units of the previously built 110 residential units, which were dilapidating as a result of neglect, have fortunately been repaired and completed, and the above-mentioned residential units have been put into operation.

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CSO: 5100/4708

BELGONUCLEAIRE DEFENDS CONTRACT WITH LIBYA

Brussels LE SOIR in French 12 Oct 84 p 3

[Article by Guy Depas]

[Text] Some people are for, and some are against. But most of all, there are people waiting until it is too late.

Some of the industrial circles most affected tell us that this is a summary of the Belgian government's position on the Belgonucleaire project of participating as project architect and research center in the construction of a nuclear power plant in Libya. "Position" is hardly the right term, of course, since the main feature of the government's attitude--avoiding any clear definition--is determined by the pressures brought to bear by the United States. And this has been the situation for the past year. This paradox is really heartrending: although Libya has asked Belgonucleaire to take part in this project, the Libyans are still preparing to turn to our competition.

At the end of October, or by the very latest 15 November, this huge contract may slip out of our hands, they say at Belgonucleaire, going either to the USSR, or as seems more likely, to German, French, British, Spanish, or Finnish industry.

The magnitude of this contract is hard to evaluate exactly, we are told. But the non-nuclear infrastructure of the plant alone represents a multiple of the sums mentioned so far: it is apparently at least 100 billion, or even 140 billion francs. Considering the high level of Belgian industry, its share would probably be enormous: hundreds of thousands of manhours of work for its high-tech businesses, but also for a mass of much less specialized subcontractors as well. And in passing, we should not forget that 50 percent would go to the government in the form of taxes, fees, etc.

Although unwilling to get embroiled in the political-diplomatic controversy between Washington and Brussels, Belgonucleaire's executives readily admit their bitterness. The arguments about military security advanced by the United States are, they suggest, only pretexts for picking a quarrel with Belgium. The United States seems to want to make Belgium the scapegoat for the liberties that some other countries, much more than Belgium, have taken with NATO's rules.

The Bomb: What's That?

Pretexts, picking a quarrel? Two years ago Libya practically signed an order with the USSR for strategically sensitive elements--the reactor's core--of the plant they had decided to build. And the specifications they submitted to Belgonucleaire show no sign, says the Belgian firm, of technology that could be used for military purposes. At any rate, Belgonucleaire would have some trouble providing Libya with such technology, as it doesn't possess it itself. As a signatory of the nuclear nonproliferation treaty, moreover, Libya has agreed to accept full international controls. In addition, the reactor's core, of Russian design and manufacture, would be installed under the surveillance and responsibility of the Soviet Union.

Given such conditions, we may well wonder why Tripoli would even be interested in diversifying its suppliers, by turning to West European, and preferably Belgian, firms, when Moscow could supply it with a turnkey plant.

The answer lies, we are told, both in Libya's trade policy and in the guarantees offered by European industrial traditions.

The Reliability of Belgian Industry

Approximately 85 percent of Libya's imports of materiel from the metal fabrications sector are West European, and only 4 percent are Russian. In fact, for Tripoli it is important to preserve its trade with the West, while limiting to the maximum any disequilibria in its trade balance. For example, Belgium has a deficit of about 30 billion francs a year in its balance of trade with Libya.

Technically speaking, West European industry can offer some benefits that the USSR can not: a regular supply of spare parts, followup of maintenance, and the possibility for the client to monitor the fabrication process in the factory.

Among its potential European suppliers, Belgium--Belgonucleaire in this instance--is a favored partner of the Libyans.

They point out that several years of working together, backed by a nuclear cooperation agreement signed between the two nations, have created a climate of mutual confidence. In the specialized area of the peaceful or civilian uses of nuclear energy, Belgian engineering is one of the best in the world. And with its strong experience in the area of large-scale exports, Belgium has for a long time demonstrated that it is more capable than some other countries of adapting to the geographic, social, and administrative circumstances of the North African market. And finally, as an enterprise with broad public participation--through the National Investment Company--Belgonucleaire is a partner with which a country with a state economy, such as Libya, can feel at ease.

Every Advantage, but One Drawback

In fact, as a trade partner with Tripoli Belgium seems to offer every possible advantage, but it also has one major drawback: the allegiance, say some, or sensitivity, as others put it, of its political leaders to pressures from the Pentagon. The Libyan affair comes on the heels of the Pegard conflict, but it is following a geometric progression, now that the deadline is imminent. And it raises with renewed intensity the problem of our economic ties with the so-called eastern bloc, bound as we are by an Atlantic solidarity that a certain form of American paranoia seems to want to exacerbate.

At this point we might well come to envy Finland its neutrality--and let us add in passing that Finland is in the best position to sign a contract with Libya if they really do wait, at Martens V, until it is too late.

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CFDT VIEWS, PROPOSALS ON MARCOULE, REPROCESSING

Orsay LA GAZETTE NUCLEAIRE in French Jan-Feb 84 pp 2-11

[Text] Introduction

* In view of the deceptive tricks in the energy debates carried on by the authorities when governments of the Right were in power, but also at the end of 1981 for the consultations with Parliament;

* In view of the growth of pressure groups assaulting local public opinion and engaging in acts of blackmail against employment, arguing that the choice is between fast breeder nuclear reactors or unemployment at the Marcoule site, the members of the CFDT [French Democratic Confederation of Labor], an organization which is part of the government majority, decided on 30 April 1983 at its General Assembly, which met at Goudargues in the Department of the Gard to make its point of view known to the public:

—on French energy policy,

—on the situation affecting nuclear electricity generating equipment,

—on the suitability of the RNR [fast breeder reactor] system,

—on the problems raised by the reprocessing of spent radioactive fuel, which CFDT workers are very familiar with, as we deal with them every day,

—and finally on the situation affecting the Marcoule site in this context in order to present concrete and realistic proposals.

As far as the CFDT is concerned, it is essential to state things very clearly: the situation affecting the Marcoule plant is a matter for concern and its future will be seriously endangered if sufficient account is not taken of the views of CFDT members.

This is the reason this pamphlet was prepared.

In doing this the CFDT local union at Marcoule is well aware of not having chosen to present an overly optimistic view of the facility or simplified and overblown slogans.

On the contrary, the CFDT union has deliberately chosen a complex and difficult path to follow:

—telling the truth, which often is disturbing,

—speaking carefully, which it is essential to do in the context of the present crisis,

—displaying an attitude of solidarity in rejecting any narrowly partisan attitude in dealing with a problem which concerns the whole country.

This contribution will therefore be added to the already numerous publications issued by the National Atomic Energy Union (CFDT) and those issued by the CFDT itself, which the local union at Marcoule totally supports.

I - Energy Policy

The possession and control of energy have always preoccupied mankind since governments have been established.

In 1974 the government of Prime Minister Messmer, taking advantage of the petroleum crisis provoked by the multinational oil firms, undertook an extremely ambitious nuclear energy program. After the policy of "everything from oil" the policy of "everything electric, everything nuclear" was initiated.

Since then, while not condemning this recourse to the use of nuclear energy for peaceful purposes, the CFDT has made clear it was opposed to this government program.

Over the years since that time the evolution of events was to prove that the CFDT was right.

1 - Forecasts of Energy Consumption

1.1 - Total Energy Consumption

(a) Historical Background

Since 1970 the official forecasts on the consumption of energy in France have been marked by errors and overestimates, which led those making the forecasts to revise them downwards, as the following table shows:

Date of the Forecasts	Forecasts for 1985 *
1970	300.0 MTEP
1973	284.0 MTEP
1974	240.0 MTEP
1975	232.0 MTEP
1978 (High Assumption)	230.0 MTEP
1978 (Low Assumption)	215.0 MTEP
1980	219.0 MTEP
1981	197.0 MTEP
Present Forecast	192.2 MTEP

In reality, the total consumption of energy by year was as follows:

1979	193.5 MTEP
1980	191.7 MTEP
1981	188.0 MTEP
1982	185.0 MTEP

* MTEP: Millions of Tons of Petroleum Equivalent

(b) Positions of the CFDT

Beginning in 1975, on the occasion of the preparation of the Seventh State Plan, the CFDT commented that "it was illusory and dangerous" to forecast a doubling in the total consumption of energy in 15 years and a doubling in the consumption of electricity in 10 years.

The CFDT proposed as an objective the consumption of 220 MTEP by the year 1990, a figure which now looks quite reasonable, considering the actual consumption of energy.

Of course, the assumptions regarding economic growth were more robust. However, the official forecasters were, above all, the producers of energy who inflated their figures to justify an exaggerated scale of investments, to the detriment of other sectors of national economic activity, which by now have been bled white.

1.2 - Consumption of Electricity

(a) Successive Forecasts

As in the case of total consumption of energy, the forecasts on the consumption of electricity were overestimated:

Date of the Forecasts	Forecasts
1974 - EDF [French Electric Power Company]	500 GWH [Gigawatt Hours] by 1990 and 1,000 GWH by 2000
1980 - President Giscard d'Estaing and Prime Minister Barre	450 GWH by 1990 and 688 GWH by 2000
1981 - Hugon Report (high assumption)	416 GWH by 1990
1981 - Hugon Report (low assumption)	363 GWH by 1990
Prior to 1980 - EDF	350 GWH by 1985
Present Estimate - EDF	315 GWH by 1985

In reality the consumption of electricity was as follows:

1981	258 GWH
1982	295 GWH

Forecast by the CFDT:

In 1980 the CFDT estimated consumption of electricity by 1990 at 350 GWH.

1.3 - Recapitulation: Adjustment of Forecasts

For the preparation of the Ninth State Plan the forecasters presented the results of their reevaluation of the forecasts for 1990, as published in the Hugon Report. This involved a simple adjustment, but the more precise adjustment should not have led to very different figures. The adjusted forecasts prepared for the Ninth State Plan were as follows:

	1985	1990
Total Energy Consumption in MTEP	192.2	201.0 - 216.5
Electricity Consumption in GWH	295.0	345.0 - 367.0
Coal Consumption in MTEP	25.1	27.4 - 31.2
Hydrocarbons in MTEP (Petroleum and Natural Gas)	107.3	93.2 - 100.4

We note that the figure of 220 MTEP estimated by the CFDT for total energy consumption in 1990 is very close to the revised official estimates and that the figure of 350 GWH for the consumption of electricity is well within the upper and lower limits of the above table.

Once again, we say that the official figures were inflated and that reality has confirmed the correctness of the CFDT forecasts.

Finally, we recall that the revised forecasts reflect an economic growth assumption of 2.2 percent for the period up to 1990 and of 4.6 percent from 1990 to 2000, which is far from zero growth.

2 - Meeting Energy Needs

To meet the energy needs of the country, having in mind the objective of maximum independence of foreign sources, the government has the following resources available to it:

—Hydroelectric power

—Coal

—Hydrocarbons: petroleum and natural gas

—Nuclear energy

—So-called "new" types of energy

—Energy savings

After the phase of "all petroleum-based energy," French governments began the "all nuclear" phase which, in the view of the CFDT, is just as dangerous.

2.1 - Hydroelectric Power

There was no change noted in this area between 1970 and 1980. Power from this source has stabilized at 14 MTEP, which is the same as the forecasts.

2.2 - Coal

There has been a decline in the use of coal, which reportedly will go down from 31.5 MTEP in 1981 to 25.1 MTEP in 1985. This decline comes from a reduction in the consumption of coal for electricity generation by EDF (15.5 MTEP in 1981 and 7.6 MTEP forecast for 1985), caused by overcapacity in nuclear-generated electricity facilities. This falling off in French coal mining, which employed 234,000 miners in 1959 and 61,500 miners in 1980, will continue unless remedial action is taken. This is because at so low a level of production many coal deposits would no longer be exploitable, and the deficits they record would be intolerable for the community as a whole. Coal, which is an unquestionable national source of wealth, after having been the victim of the "all petroleum-based energy" strategy, will be definitively brought to the point of collapse by an "all nuclear" strategy.

2.3 - Hydrocarbons (Petroleum and Natural Gas)

Consumption progressively declined between 1970 and 1974, increased slightly until 1980, and then began to decline again in 1981 and 1982. Consumption went down from 132 MTEP in 1973 (117 MTEP in petroleum + 15 MTEP in natural gas) to 115.4 MTEP in 1981 (90.7 MTEP in petroleum + 24.7 MTEP in natural gas). In 1980 the Barre cabinet forecast consumption of 68 MTEP in petroleum and 42 MTEP in natural gas in 1990. Present forecasts (107 MTEP for 1985 and 100 MTEP in 1990) confirm the decline in the use of hydrocarbons in overall energy consumption. Excess refining capacity and the continued validity of natural gas contracts with foreign countries (Algeria and the USSR) will raise serious problems of employment in the petroleum sector.

2.4 - Nuclear Generation of Electricity

2.4.1 - The Uranium Market

* It is presently very soft, due to the reduction in nuclear programs throughout the world. The price of uranium, contrary to the experience with other sources of energy, has steadily declined for several years, placing several producing countries such as Niger in serious financial difficulty.

* World reserves of uranium are substantial and dependent on the cost of extraction which producers are willing to pay. By contrast the sales price depends on the relationship existing between supply and demand.

* Thus, presently weak demand has led to relaxation in the prospecting effort, which threatens to be harmful in the coming decades.

* An increase in costs will result from this situation, but this will only be temporary and will not raise a question about the importance or even the necessity of nuclear energy programs.

2.4.2 - At the End of 1982 Installed French Nuclear Generated Electricity Centers Were As Follows:

—Older Nuclear Generators	8 Units	2,335 MWe*
—Phenix RNR	1 Units	233 MWe
—PWR [Pressurized Water Reactor]	21 Units	19,060 MWe
TOTAL		21,628 MWe

*MWe are Megawatt Years

About to Enter Into Service:

—PWR 900	4 Units	3,600 MWe

Units to Enter Into Service Before 1985:

—PWR 900	6 Units	5,400 MWe
—PWR 1300	5 Units	6,500 MWe

Units to Enter Into Service Before 1990:

—PWR 900	3 Units	2,700 MWe
—PWR 1300	13 Units	16,900 MWe
—RNR SPX 1	1 Unit	1,200 MWe

By 1990 total installed capacity will be 57,928 MWe. However, according to the EDF, the available capacity will be 56,000 MWe, taking into account possible stoppages and delays in starting up.

2.4.3 - Load Factor and Available Power of Nuclear Powered Electricity Generators

To achieve the best return, it is necessary for nuclear powered electricity generators to operate from 6,000 to 6,200 hours per year. Therefore, they need to have a load factor of about 70 percent.

Under these conditions the installed nuclear powered electricity generating plant of 56,000 MWe (EDF estimate) by itself will be able to provide all of the electricity which France will need in 1990, or 350 GWH.

This extreme position is impossible to reach because it will be necessary to cover variations in load with oil or coal-fueled electricity generators. In any case it will also be necessary to use the 70 GWH of electricity generated by hydropower.

It is generally accepted that the role of nuclear generated electricity, taking into account the flexibility required of the electrical network, cannot exceed 70 percent of the total. On the basis of 350 GWH of electricity forecast to be consumed in 1990, nuclear power will not be able to provide more than 245 GWH. That means that nuclear powered electricity generators will operate with a load factor of about 50 percent, which is below the threshold of the most efficient return.

2.4.4 - Consequences

The consequences of having too large a number of French nuclear powered electricity generators will be serious and will lead to a crisis situation. The principal aspects of this crisis include the following:

(a) Underutilization of PWR Reactors

With the 56,000 MWe of capacity of French nuclear powered electricity generators producing 245 GWH annually by 1990 and with a load factor of about 50 percent, there will be considerable economic waste. They will be operating for 4,400 hours per year instead of 6,000 to 6,200 hours per year.

(b) Non Use of Coal

Taking into account the 70 GWH of electricity produced by hydropower, there will only be about 20 GWH to be produced by coal, or one-third of the 1981 level. This continues the decline in the use of coal over the 1985-1990 period.

(c) No Use for the Fast Neutron Reactor

As the PWR plant already installed or planned to be installed will be in excess of needs, there will be no energy justification for the development of the RNR system for an additional 1 or 2 decades, and there is a risk that this technology will be obsolete after that.

(d) Little Need for Development of 'New' Forms of Energy

This particularly applies to renewable forms of energy, such as solar power.

(e) Little Incentive for Energy Savings

This will especially be the situation when the EDF will have to sell its surplus electricity generating capacity.

(f) Sale of Electricity to Foreign Countries

There is nothing very certain about this, as it is difficult to imagine a neighboring country or government which would turn itself over, its hands and feet tied, to France, in so vital an area as its supply of electricity. No estimate of potential electricity exports has been developed by the EDF, and potential sales contracts could only be on a short term basis to fill a temporary gap.

2.4.5 - A Crisis Situation

The French nuclear industry, because of the obvious surplus capacity being developed under the program, is moving into a crisis situation:

—Few Or No Immediate Orders for Equipment

The nuclear electricity generating industry (under the program implemented between 1974 and 1981), in the mind of its promoters, was to be split rather rapidly between the domestic and the export market. This has not happened. The export market has not developed, despite the cries of triumph of former Prime Minister Chirac, who wanted to sell nuclear electricity generators to Iran.

This industry is capable of producing six PWR plants per year. In the mind of the forecasters, of the six units per year, four were initially to be built for France and two exported. Ultimately, two would be built for France and four exported, for example.

—In that area there was also an error made in the forecasts.

As it was originally envisaged that the reactors would eventually be replaced after 20 years of operation, the surplus capacity of the nuclear industry therefore threatens to be long lasting.

The foreign market for reactor sales is not very large, and there is competition with a number of foreign companies.

The economic recession explains in part the stagnation in the demand for electricity. However, this does not explain everything and in particular why the role of nuclear energy is not increasing in any country other than France. In fact, many countries have concluded that "betting on nuclear energy" is not worth the trouble of being tempted on so large a scale and that coal is preferable for the generation of electricity.

* Estimated Potential for the Construction of PWR Reactors Too High

With a capability of building six PWR's per year, it is quite clear that the French nuclear industry is moving toward a very serious crisis in economic terms and in social terms as well, due to the consequences for the workers. The government decided on 27 July 1983 to build two PWR's in 1983-84 and one or two PWR's in 1985. Clearly, problems of employment will be raised, and the reconversion of part of this industry should be considered, beginning right now.

* No Foreign Orders

Overall strategy in the nuclear industry has been based on high power units, which are difficult to sell to small countries. It is feared that a market for nuclear generators of the 300 MWe type will not develop or that France will not be able to enter this market.

2.5 - Proposals of the CFDT

The CFDT made reasonable proposals, but no one accepted them. For 1990 these proposals may be found in the following, comparative table, published in 1980 and stated in GWH.

	Barre Estimates (1980)	Hugon Report (1981) (High)	Hugon Report (1981) (Low)	CFDT (1980)
Hydroelectric Power	64	65	65	80
Coal	30	20	30	90
Nuclear	330	270	298	140
Heavy Fuel Oil and Various Other Fuels	26	7	23	40
TOTAL	450	362	416	350

Under this CFDT estimate we would have built about two nuclear power units per year, which would have allowed the nuclear electricity generating industry to operate smoothly, reaching a point where the replacement of nuclear power units at the end of their useful lives would have constituted a substantial role. The domestic coal industry would have been allowed a place in the overall energy picture sufficient to prevent the collapse of the coal market. There would have been coal production but also production for coal loading ports, transportation facilities, etc.

At the point where we now stand there is no longer any alternative to reconverting part of the nuclear power industry, which still has several years of work to meet orders presently on hand. It will be necessary to use these years to prepare for other kinds of production, because in addition to the nuclear area itself this reconversion effort involves civil engineering, the electromechanical industry, electronics, data processing, metallurgy, etc. It is therefore possible to find for the nuclear power industry work for the export market involving medium sized developing countries. For example, work that could be done might include:

—Hydroelectric generating plants.

—Thermal-powered electricity generators, particularly those using coal, but also those which use fuel oil or natural gas as fuels.

—The rational use of energy.

—New and renewable forms of energy.

In France the nuclear powered electricity generating industry could contribute to the development of co-generated heating networks involving the rational use of energy.

Rather than spending 10 to 15 billion francs per year to build useless nuclear power plants, wouldn't it be better to help the French nuclear industry to restructure and modernize itself in order to take part in the world market in those sectors where French industry has a certain advantage?

II - The Fast Breeder Reactors (RNR)

1. Characteristics of This System

1.1 - The Official View

These characteristics are stated in energy and political terms and have been broadly disseminated by the French Atomic Energy Commission (AEC), but still in a merely qualitative and incomplete way:

(a) A Very Substantial Increase in Our Reserves of Uranium

This can be achieved by the transmutation of our very abundant supplies of uranium 238 into usable plutonium 239. This involves multiplying our reserves by a factor of 50 to 70 times, making France as rich a country as Saudi Arabia!

(b) Improvement in the Security of Nuclear Energy Production

This involves a reduction in the rate of overall radiation of the workers, based on the results of very encouraging tests of the "Phenix" reactor at Marcoule and on the very small amount of uranium required to be mined.

(c) Self-Sufficiency for France in Our Production of Electricity

This is to be achieved both in terms of technology (the RNR system is specifically French) and of our supply of uranium (upgrading uranium 238).

(d) Possibility of Using RNR's to Burn Plutonium

This would involve burning plutonium and other, long-lived radioactive elements.

1.2 - CFDT Viewpoint

The principal official arguments involve two serious errors. On the one hand they do not set out the advantages of the RNR system in viable, quantitative terms. On the other hand they omit a certain number of aspects of major importance. Also, while accepting the preceding official argument it is essential to set down clearly the impact and the limits of this point of view.

(a) Yes, the RNR's make it possible to make savings on the use of natural uranium. However, the figure of multiplying our reserves by a factor of 50 to 70 times would not be achieved for several centuries and maybe not for 1,000 years. This could only be achieved on the basis of the construction of a very complex and very expensive nuclear industry and would require the processing of enormous masses of plutonium amounting to tens of thousands of tons.

In effect:

* Very precise studies have shown that the gain in natural uranium using RNR's, as plutonium becomes available, would not make it possible to hope for savings of much more than 25 to 30 percent over a period of 80 years, on the basis of our present consumption (see table in p[illegible]aph 1.1).

* Studies made by the AEC have eve[illegible] [illegible]n that the temporary introduction of RNR's with a low breeding capacity (the "Superphenix" reactors now under study) would be rather negative for the availability of uranium. From this point of view it would be better now to seek to obtain the maximum amount of plutonium produced by the PWR reactors, while uranium is abundant, rather than to burn uranium in the RNR slow breeder reactors.

* Finally, the amounts of plutonium that would need to be processed would be substantial because the energy which is intended to be derived from the very abundant supplies of U 238 would necessarily involve its conversion into an equivalent amount of plutonium.

(b) Yes, the rate of radiation of the personnel working at "Phenix" reactors will be less than that to which EDF workers at the PWR reactors are exposed. However,

in the RNR system radiation problems are not encountered at the reactor itself. The radiation danger is involved in the fuel cycle, outside the reactor.

In fact:

* The manufacture of plutonium-based fuel requires installations involving protected production lines, which turn out plutonium-contaminated technological waste, involving exposure to radiation and contamination for the workers.

* The reprocessing of fuel from the RNR's is characterized by important, specific constraints, which include:

—The need to reprocess the irradiated fuel quickly to reduce the time for holding the plutonium outside the reactor.

—The very high radioactivity of the fuel to be reprocessed, due to the high level of radiation within the reactor and the limited amount of cooling that takes place.

—The amount of plutonium to be reprocessed is very substantial. It is about five times more than that resulting from the cycle of PWR reactors producing electricity. This involves the construction of a retreatment plant for the four RNR units, rather than the UP 3 plant at La Hogue [near Cherbourg] used for 20 to 25 PWR reactors (using identical plutonium reprocessing lines).

This mass of plutonium in circulation will lead to losses of nearly proportional amounts of fissile material (of 1 to 1.5 percent losses of plutonium in the waste fuel being reprocessed). Hence, this would involve a reprocessing cycle for the RNR's which would produce more pollution than the PWR's do.

—Moreover, the entry into service of the RNR's would require massive supplies of plutonium from the PWR reactors (about 10 to 11 tons for one RNR and its fuel cycle). This would make reprocessing of PWR fuel an essential operation. Now, it is not clear at present that this operation would be justified from the point of view of the security of stockpiling of radioactive waste. The possibility of not reprocessing these wastes is beginning to be considered very seriously in many countries, which consider this line of action much simpler--and therefore less expensive--and less a source of radiation and pollution. This is because:

* It would not produce technological waste, including certain quantities of waste contaminated by long-lived Alpha elements (presently, a ton of PWR fuel reprocessed at La Hague generates 21 cubic meters of waste at a UP 2 reprocessing unit. For a UP 3 reprocessing unit the anticipated quantity of waste would be less).

* It might make possible a safer kind of long term storage of Alpha particles such as plutonium, neptunium, and americium in a container of U O2 of fuel irradiated in a PWR which would probably be less soluble, in any case less so than in the case of vitrification in geologically deep locations.

* It would be less of a threat to proliferation, because since the plutonium would not have been removed from the fuel rods, it would not be directly usable to make

nuclear devices for military purposes. It is on the basis of certain of these arguments, for example, that Sweden has withdrawn fuel which was to have been reprocessed at La Hague in order to store the fuel in untreated form in geological sites within its own territory. In the same way West Germany is beginning to feel serious concern over what is to become of the wastes from reprocessing which have been returned to it by COGEMA [reprocessing company] from its plant at La Hague.

—Regarding the collective irradiation of workers due to uranium extraction, the basic dosage due to an RNR would be of the same order of magnitude as that from the use of natural uranium, that is, from 25 to 30 percent over the following 80 years. This relatively slight reduction in radioactivity should be compared with the increase in the dosage due to the end of the RNR cycle: the preparation and withdrawal of radioactive fuel containing large amounts of plutonium and other products of fission.

(c) Yes, the RNR system is essentially French in concept and construction, contrary to the PWR system. However, is this enough of a reason to adopt it no matter what the cost and whatever the conditions? It is appropriate to recall the "Concorde" aircraft affair. In order to sell 14 aircraft in all the French and British taxpayers had to put up 40 billion francs.

From the economic point of view, two important points should be considered: on the one hand, the cost of this system (independent of its usefulness), and on the other hand, the manner in which it would be financed.

(c.1) Cost of the RNR system:

This can be broken down into four important elements:

(1) The price of the reactor, as such. Presently, this is 2.2 times more expensive than a PWR of the same power. ("Superphenix 1" has a power of 1,300 MWe.) This figure could be reduced to a factor between 1.6 and 1.8 times more expensive for a series of four to eight reactors ordered at the same time. However, in any case the cost would be clearly higher for technological reasons (the presence of two sodium circuits, etc).

(2) The price of the installation for the manufacture and reprocessing of fuel. This would involve shielded lines of production for fuel and lower capacity reprocessing plants. The cost of these installations and of related facilities at a given plant site, such as Saint-Etienne des Sorts, comes to almost the same amount of money as the cost of the reactors themselves: the 80 billion francs for this project as a whole breaks down in very rough terms to 46 billion francs for the four SPX reactors and 34 billion francs for the FOR (fuel fabrication plant), the PURR (retreatment facilities), and the stockpiling ponds.

(3) The price of the plutonium needed for the fabrication of the first two cores (the following cores would be reconstituted on the basis of the plutonium recycled at the site). The cost of the plutonium from the first two cores depends essentially on the system used for the retreatment of the fuel from the PWR system:

Viewpoint of the AEC:

The reprocessing of PWR fuel is a necessary evil. Its cost should therefore be fully recovered from the electricity produced by the PWR's. The plutonium derived from reprocessing is thus a byproduct having no particular price or priced very low (60 francs a gram in 1990 and 100 francs a gram in 2000).

The 'American' Viewpoint

The stockpiling of unreprocessed fuel is considered less hazardous than the fuel and related wastes after reprocessing. Reprocessing therefore is a necessity related to the development of the RNR system, and its cost therefore should be imputed to the plutonium produced. At 10,000 francs for each kilogram of uranium reprocessed (a realistic cost for the UP 3 reactor), a gram of plutonium comes to about 1,100 francs, or about 12 billion francs for the 11 tons of the first two cores mentioned above and necessary for starting up an RNR reactor. Consequently, this cost is equivalent to the cost of construction of the RNR reactor and the resultant, total cost is twice the initial investment.

4 - The operating cost of the reactors and the plants for the fabrication and reprocessing of fuel elements. This item is not very large, compared to other costs. The PWR and RNR reactors cost about the same in this connection.

The value of the residual uranium recovered from PWR fuel is almost nothing. Therefore, the only benefit to be expected from the RNR system concerns the price of natural uranium and the isotopic work separation units which are saved by using this system. However, the cost of this item does not amount to more than from 10 to 15 percent of the price per kilowatt hour of electricity produced by a PWR and amounts to very little on an overall basis.

(c.2) Financing of the RNR System:

As we have seen, one of the principal characteristics of the RNR system is that it requires the investment of considerable amounts of capital as compared to relatively low operating costs. We also find this same tendency in the PWR system, although to a lesser degree. This required investment of capital is all the more onerous since it takes place long before the entry into service of the reactors (about 10 years). When we recall that the total indebtedness of the EDF as of the end of 1982 was about 150 billion francs, compared to an annual budgetary deficit of about 8 billion francs and that the loans entered into by this public enterprise are principally denominated in U. S. dollars, we can see how dangerous a considerable RNR program would be (about 80 billion francs for the "modest" project at Saint-Etienne des Sorts) for the independence of France and its budgetary equilibrium.

In concluding this economic section, it would be appropriate to recall that:

* The cost of the RNR system is very high in investment terms: from four to six times the cost of the PWR system, according to our initial calculations.

* The need to bring in massive amounts of American capital to finance this system makes the argument that the RNR system is a French system essentially foolish.

* The cost per kilowatt hour of electricity produced, assuming that the plutonium costs nothing, is in the same order of magnitude as electricity obtained from coal (about 33 centimes per kilowatt hour).

* If the strategy of obligatory reprocessing does not turn out to be the right one, the additional cost due to the extraction of the plutonium would multiply the cost of electricity per kilowatt hour by a factor of about two, making it much more expensive than a kilowatt hour of electricity produced by an oil-fired generating plant. (See Table 2 above)

(d) Regarding the last point of the government argument presented above, concerning the possibility of using the RNR reactors as incinerators for plutonium and other long-lived radioactive elements, it would be appropriate to make the following comments:

* The PWR can also burn plutonium, sometimes with greater efficiency in terms of the money spent.

* The very object of the RNR system is not to make the plutonium disppear but, on the contrary, to produce it from our uranium 238 in order to increase the value of our national wealth in terms of natural uranium.

1.3 - The Military Aspects

The RNR system is the only system presently capable of providing plutonium of high isotopic quality (plutonium containing more than 95 percent of isotope 239 in the radial covers) in a quantity sufficient to support the development of our tactical nuclear striking force.

After the shutdown of reactors G 1, then G 2, and soon G 3 at Marcoule, and before we have developed the process of isotopic enrichment of plutonium by laser excitement, the development of the French nuclear striking force will be totally dependent on the proper functioning of the Phenix and later the Superphenix reactors and on the plants reprocessing their fuel: the SAP-TOR shop for the reprocessing of the Phenix and the ISAI installation for dismantling Superphenix fuel, and the UP 1 plant and then the MAR 600 plant now under construction for the reprocessing of this fuel.

This important characteristic of the RNR reactors is certainly at present one of the few, undeniable advantages of this system, although it is rarely, if ever, mentioned in the debates on this reactor system.

However, it should be noted that earmarking for military use the plutonium generated in the radial covers constitutes a fatal blow to the rate of regeneration, originally already slow in this system. It makes even more dubious the prospect of developing this system for civilian purposes. (See the April 1982 issue of ENERGIE magazine on French manufactured equipment and economic information.)

2 - The RNR's in the Global Energy Context

2.1 - Reserves of Natural Uranium

The size of these reserves is regularly a matter of controversy for several reasons. Reserves are traditionally under estimated for military reasons (uranium is a strategic material) and for economic reasons (to maintain the idea of an apparent shortage to keep up the price). A fully detailed inventory of reserves is difficult to prepare.

The volume of these reserves also depends on the costs of production which people are willing to pay: 5 million tons at $130 per kilogram of uranium or 14 million tons at $560 per kilogram of uranium, according to the OECD [Organization of Economic Cooperation and Development] in 1978.

Finally, the inventory of reserves of this mineral is far from complete: evidence of this is the discovery of the Roxby deposit officially announced in Australia in 1982. This deposit alone amounts to 1.2 million tons or 30 years of world consumption at the 1982 rate. The uranium contained in phosphate (4.2 million tons in Morocco) and even more in sea water (about 4.5 million tons), which the Japanese plan to extract at the rate of 2,800 tons annually in the year 2000, using barges moored in strong ocean currents.

Regarding the reserves to which France has access--in metropolitan France and through part ownership of uranium ore in foreign countries--these make it possible to satisfy our needs until 2050 on the basis of the requirements of the PWR reactors that will be installed by 1990 (53.6 MWe, or 5,360 tons per year at a load factor of 50 percent). This does not take into consideration:

* New discoveries in France and overseas.

* Uranium extracted from phosphate imported as fertilizer (600 tons per year, equivalent to the requirements of two Superphenix RNR reactors of 1,450 MWe).

* Improvements in the operation of the PWR reactors.

* Improvements in the process of enrichment by laser excitement.

* The discovery and development of other reactor systems (RNR's using enriched uranium, spaliation reactors, fusion, etc).

2.2 - Consumption of Natural Uranium

Contrary to the situation regarding reserves of uranium, the consumption of natural uranium has been much overestimated on the basis of exaggerated growth in our demand for energy, essentially to justify our PWR reactors and the need to replace them with the RNR reactors.

Forecast of Cumulative World Requirements for Natural Uranium in Tons	By 2000	By 2030
Andre Giraud Estimate (1975)	4 to 6 million tons	24 to 42 million tons
OECD (Beginning of 1982)	1.1 million tons	6 million tons

The present tendency is frankly downward, both on a French national as well as on a world basis (less energy consumption due to energy savings and to a decline in growth, as well as serious cuts in the nuclear power generating facilities planned or under construction in many countries). There is no basis for foreseeing any major change of direction in the coming decades. As a result, it is not reasonable to speak of a uranium shortage before the middle of the next century.

2.3 - Use of Plutonium from Already Functioning Reprocessing Plants (UP 1 at Marcoule, UP 2 at La Hague) or Those Under Construction (UP 3 at La Hague)

The plutonium from these plants finds its natural outlet in the fabrication of the first two cores of the Superphenix RNR reactor at Creys Malville, which should go critical at the end of 1984. In the years to come, if it operates properly, this reactor will consum less than 2 tons of plutonium per year. The surplus output of plutonium from the UP 1, UP 2, and then UP 3 plants can then be "burned" in three different ways:

(a) In other sodium cooled RNR reactors of the Superphenix type, the next generation of this reactor system. This process will be very expensive and is not justified at present, in view of the foreseeable energy prospects (see Chapter I above).

(b) In fast breeder reactors cooled with pressurized water, called submoderated reactors (RSM). These reactors, which are presently under study by the AEC, will probably be less expensive than sodium cooled RNR's, but they combine the disadvantages of the PWR's (high pressure water circuits) and the sodium-cooled RNR's (hexagonal assemblies, the use of 13 tons of plutonium in the cores). They can be made into supergenerators, although they will have a relatively low energy output.

(c) In standard PWR reactors, replacing enriched uranium with plutonium. This solution will not require very substantial study and, by averaging out the added cost of fabrication of plutonium fuel elements, it has the advantage of "burning" the plutonium with a high output of energy. This system is not a supergenerator but, on the contrary, is a plutonium incinerator.

2.4 - Improvements in Nuclear Reactors

The PWR system has achieved a near monopoly over the production of nuclear-generated electricity. A great deal of research has been carried out to reduce the consumption of uranium in these reactors. Among the innovations which should be announced shortly are:

* The development of AFA assemblies (from Plant Y at Pierrelatte) which can be disassembled and which permit improved combustion of uranium.

* The development of spectrum variation assemblies (RVS) which make possible savings of natural uranium in the order of 20 to 25 percent (agreement between Westinghouse and Mitsubishi, Framatome studies).

* An increase in the rate of combustion of the nuclear fuel.

* The possible use of sodium-cooled reactors using highly enriched uranium (containing 11 percent uranium), making it possible to save hundreds of kilograms of uranium, with no need for reprocessing.

2.5 - Enrichment of Uranium Using the Laser Excitation Process

This is a very promising technique, although it introduces a serious risk of nuclear proliferation. It will probably become available by the end of the century. It has three important advantages:

* Low cost of the isotopic work separation units (UTS), making it possible to lower the uranium content of the waste products to levels in the order of 0.08 to 0.05 percent and to achieve a reduction of 20 to 25 percent in the consumption of natural uranium. This compares to a uranium content of waste products of 0.20 to 0.25 percent from the gaseous diffusion process.

* The possibility of obtaining substantial stocks of low quality uranium from the gaseous diffusion plants by lowering the uranium residue from 0.20 to 0.05 percent, making it possible to market considerable quantities of enriched uranium. This would constitute a true strategic stockpile, available on site.

2.6 - The RNR Reactors in the French Nuclear Power Generating System

As we have already seen, since the PWR reactors will be in surplus supply in about 10 years, if not for longer, any present introduction of RNR reactors would not appear to be desirable. It would cost too much at a time of crisis when the shortage is not uranium but rather available capital. French coal mining policy, already on shaky grounds, would be dealt a fatal blow by the introduction of the RNR reactors and would probably never recover.

3 - Conclusions and Proposals of the CFDT

3.1 - There Is No Point in the Development of the RNR System

(a) Neither over the short term, because:

* of the already large number of PWR reactors, soon to be surplus to our needs.

* of the low cost of uranium.

* of our excess uranium enrichment capacity (Eurodif is operating at one-third of its capacity.

* of the excessive cost of this system and difficulties in financing it.

* of the constraints imposed by the obligatory and immediate reprocessing of PWR fuel.

* of the difficulties of other energy sectors such as coal mining.

(b) Nor over the long term because:

* of the extraordinarily large amounts of plutonium which it will be necessary to handle, with the risks involved in this handling and the waste products which it will generate.

* of the probably obsolescent character of this system in a few decades.

3.2 - We Must Orient Our Research Effort in Four Directions:

(a) Improvement of our available supplies of natural uranium:

* by continuing and strengthening prospecting in France and overseas.

* by developing a system for recuperating uranium from the phosphates which we import.

* by research into methods of extraction of uranium from sea water.

(b) Improvement in the returns from enrichment of uranium:

* by lowering, if necessary, the rate of accumulation of waste products from enrichment by the gaseous diffusion process; Eurodif is only operating at one-third of its capacity.

* by developing a process of uranium enrichment by laser excitation which will make it possible to obtain better returns from our reserves of natural uranium and to use the substantial quantities of spent uranium as a strategic reserve.

(c) Improvement in the functioning of the PWR reactors and in the stockpiling of spent fuel in pools, with the following, principal objectives:

* lowering the radiation dosages absorbed by the workers at nuclear centers (improvements in shielding materials, detection of cracks in the shielding, the control and elimination of radioactive sludge, etc).

* increasing the reliability and the security of reactors (study of the resistance of materials to fatigue and thermal shock; improvements in valves; the study of vibration, hydraulic discharges and the behavior of structures; improvements in control and regulation systems, etc.).

* increasing the capacity of stockpiling pools; making assemblies more compact, dismantling and consolidating fuel elements, identifying stockpiling techniques resistant to seismic disturbances, etc.

(d) Improvements in efficiency and the study of new reactor systems:

* for the PWR's: develop spectrum variation assemblies and expand the rate of combustion of nuclear fuel.

* studies of other systems:

—sodium-cooled reactors using highly enriched uranium which will make it possible to incrase our technological lead in this area and save substantial quantities of natural uranium without having recourse to the plutonium cycle.

—PWR reactors able to consume plutonium from the present reprocessing plants more efficiently.

3.3 - Reprocessing Should No Longer Be Considered a Necessary Evil:

—doing everything ppossible to avoid this expensive, delicate, and even dangerous operation, which generates large amounts of technological waste and which, for all of that, does not provide a long term solution to the problem of radioactive waste.

—studying as soon as possible the solution of not reprocessing nuclear wastes: the basic principles for research and development could be:

* study of a container for storage in a geologically deep site.

* study of the physical chemistry of the dissolution of uranium oxide [U O2] and of the other components of irradiated fuel rods in geologically deep sites (conditions leading to shrinkage of the rods, low level leaching).

* study of potentially usable geological sites: characteristics and research on the ground.

* establishment of an underground laboratory to make it possible to study under actual conditions the local situations affecting the dissolution of irradiated fuel, the future behavior of dissolved products, the thermal behavior of rocks, etc.

III - The Reprocessing of Irradiated Fuels

1 - Why Reprocessing

1.1 - From the Civilian Point of View

—reprocessing "officially" has a dual objective:

* on the one hand recuperating plutonium in large quantities to supply the RNR system;

* on the other hand improving the condition of the nuclear wastes coming from nuclear plants;

* however, the uncertainties associated with these two objectives often make it impossible to clarify the debate;

* when we speak of the RNR's, it is often said that this system is economically competitive, because plutonium is a byproduct of the reprocessing of nuclear waste and that for this reason this raw material is available at low cost;

* when we speak of the possibility of not reprocessing fuel for reasons of cost or the complexity of the operations, we are then told that reprocessing is needed for the RNR system!

—for the CFDT there is no question of allowing such ambiguities to drag along and to continue such confusion. The RNR system, as we have demonstrated, is not a system for the future. Moreover, it comes completely after the reprocessing of fuel. In no way should it influence decisions concerning reprocessing. The only question which we should answer is therefore: will reprocessing make it possible, yes or no, to improve the conditioning of irradiated fuel over the medium and long term. If the answer is "yes," then what conditions should control this operation and what should the price be?

Clearly, the CFDT cannot answer these questions, which go beyond its knowledge of these matters. On the other hand we consider that these questions can be answered by the AEC and that, in this connection, it should make available the necessary means to answer them and to propose solutions. Among other things, it will be essential for the AEC group to break out of the impasse which it has created around the reprocessing issue. The AEC has always presented this as an urgent and unavoidable matter, whereas there are other solutions which have practically not been studied at all, such as deferring reprocessing until after the process has been improved or stockpiling this material as irradiated fuel, which can result in improved conditioning of the nuclear wastes and may even cost much less.

1.2 - From the Military Point of View

Reprocessing is an OBLIGATORY operation: due to the miniaturization of nuclear warheads, plutonium has now replaced enriched uranium. The military also have a continuing need to obtain supplies of plutonium to renew their warheads (improvement in isotopic quality) or to increase the number of warheads.

The high isotopic content of Plutonium 239 and the quantities needed by the military imply, as we saw previously, the following sequence of operations:

PWR Reactors

Reprocessing of PWR Fuel

Fast Breeder Reactors

Reprocessing of RNR Fuel

Nuclear Bombs

With the future development of enrichment by laser excitation, this sequence will be simplified, as follows:

PWR Reactors

Reprocessing of PWR Fuel

Laser Enrichment

Nuclear Bombs

In each of these cases reprocessing of the fuel from nuclear reactors is considered an essential link in the development of a nuclear striking force. However, the quantitative needs for plutonium are much less in the second scenario above.

As the CFDT has always rejected the idea of atomic weapons for France, it goes without saying that under no circumstances can the CFDT support the idea of reprocessing irradiated fuels as an operation solely justified by military necessity.

After having set out the necessary foundations for the conduct of the debate, we will review the present situation regarding the reprocessing plants in France, with a more detailed study of the situation at Marcoule.

2 - Activities of the Reprocessing Plants

The UP 1 plant at Marcoule went into operation in 1958 with purely military purposes in view. It reprocessed fuel from the G 1 and later from the G 2 and G 3 reactors. The UP 2 plant at La Hague at this time reprocessed the fuel from the EDF UNGG reactors, which are called "old nuclear systems" in the nuclear powered electricity generating system.

Progressively, with the entry into service of the HAO shop at La Hague, the UP 1 plant was reconverted to handle the reprocessing of spent fuel from the PWR reactors, which have been in operation since 1974. The Marcoule plant has been assigned to the reprocessing of fuel from the UNGG reactors, along with its military activities. It should be noted that the "old nuclear systems" in the UNGG plants will have practically ceased operation by the 1990's, which limits the prospects for the UP 1 plant. Moreover, after more than 30 years of operation, this plant will be obsolete, which will make it unusable under conditions of proper security.

The pilot SAP (Pilot Shop Service) at Marcoule is also reprocessing the core of the Phenix RNR, and the covers have been reprocessed by the UP 1 plant. Subsequently, the core of the Superphenix should be reprocessed at the High Speed Oxide Treatment [TOR] plant at Marcoule. The covers will be reprocessed in a shop to be constructed after the ISAI unit now being built at Marcoule.

Thus, we can see clearly the division of tasks which has been worked out between the sites at La Hague (reprocessing of the PWR fuel) and Marcoule (the remaining part of the "old nuclear systems," military purposes, the Phenix, and the Superphenix).

These activities involve some problems and are the Achilles heel of French strategy. Thus, following the parliamentary debate in October 1981 the minister of industry set up, under the Higher Council of Nuclear Security, a scientific commission charged with analyzing the problems involved in the management of irradiated fuel and radioactive waste. This commission, called the Castaing Commission from the name of its chairman, a member of the French Academy of Sciences, included 12 members, one of whom was Jean Teillac, high commissioner of the AEC. The commission's terms of reference, dated 11 December 1981, stated that its role consisted of examining proposals for extensions at the UP 2/800 and UP3 plants at La Hague and to make "appropriate proposals to permit France to maintain the necessary technological skills to ensure the management of irradiated fuels under the best condiditions."

The Castaing Commission therefore did not have to express its views on the propriety of the construction program under way at La Hague, nor on the choice of the PWR-RNR nuclear reactor strategy.

For its part the CFDT regretted that the concept of the new plants was definitively decided on and the work begun without waiting for the report of the commission.

3 - Some Conclusions of the Castaing Commission

The report of the commission states that certain improvements have been made in the techniques used in the present plants and notes that working conditions have been improved since 1980 at the plant at La Hague. The commission stated: "These improvements should be a matter for constant vigilance, particularly because a certain number of difficult situations still exist. Technical modifications by themselves will not be enough. It is important to adopt another type of human relations. A greater willingness to listen and an improved dialogue with the workers are requred. The people who assume the risks should be associated with the measures taken concerning the reduction of these risks."

Although the commission was silent on Marcoule, the CFDT sees in the lines quoted above an implicit recognition of the CFDT action taken at the two sites to analyze with the workers the problems existing in the plants and to propose solutions.

However, the commission raised numerous questions about the possibility of providing, in the present plants, sufficient protection for the personnel and the environment, as well as regarding the long term management of the nuclear wastes resulting from reprocessing.

Furthermore, the commission confirmed that the storing in a pool of irradiated fuel for several years posed no notable problem. On the contrary, this made it possible to improve reprocessing techniques noticeably.

Improved separation of fission and transuranian products and the implementation of new procedures for compacting technological waste would make possible safer management of the radioactive wastes from reprocessing.

Finally, the Castaing Commission confirmed very clearly that reprocessing should be seriously considered along with the methods of direct stockpiling of irradiated fuels and asked that the following, very detailed studies be undertaken:

—regarding more rapid reprocessing, notably involving improved separation of the different products (long-lived Alpha particles).

—on the procedures for stockpiling irradiated fuel and radioactive waste. It should be possible to remove materials from the stockpile, taking the spent fuel or the waste out for reprocessing or definitive stockpiling.

These studies should make it possible to make a choice, after 1990, between reprocessing, the stockpiling of irradiated fuel, or an intermediate solution making use of the two management procedures.

Moreover, this choice will be linked, as we previously saw, to military or civilian needs for plutonium and to whether or not the RNR system will be continued in the future.

—the right of the CHSCT (Committee on Health, Security, and Improvement of Working Conditions) to intervene to prevent the installation of dangerous equipment or procedures.

—the strengthening of the Radioactive Protection Services and the enactment of legislation guaranteeing their independence, as well as that of other security organisms (the IPSN, SCSIN, and the SCPRI).

—the obligation of informing the management-labor company committee of all new projects and the effective possibility for the committee (on company time) to play a role when technical decisions are made.

—the access to security files in the plants.

The CFDT continues to demand:

—that complete information be provided on the costs related to the management of irradiated fuel.

—that foreign reprocessing contracts be renegotiated and transformed into contracts for medium term stockpiling.

—that the government commit itself to continue studies on all techniques for the management of irradiated fuel.

—that the definition and followup of the program for the management of radioactive waste be turned over to a management structure which is multidisciplinary, independent, and autonomous in terms of the industrial operators of the plants.

—that the Castaing Commission continue its work, and particularly examine the situation affecting the Marcoule plant, and indicate the technologies or installations which do not provide all of the required safety guarantees and regarding which new studies should be undertaken.

IV - Marcoule in the General Context

1 - Activities at the Marcoule Site

There are two, distinct units at the Marcoule site: the Center for Nuclear Studies of the Rhone Valley, which comes under the AEC, and the Marcoule Establishment, which comes under COGEMA.

In March 1983 the Center for Nuclear Studies employed 1,002 workers, while the second establishment employed 2,250 workers (its authorized strength is 2,345). This brings the total number of workers coming under the AEC Group to 3,350. To this total should be added the employees of a certain number of sub-contractors who operate more or less permanently at the site. This brings the total number to more than 4,000 workers.

1.1 - Center for Nuclear Studies of the Rhone Valley of the AEC (CEN-VALHRO)

This center includes essentially:

—the Phenix reactor.

—the Pilot Shop Service (SAP), which is getting further and further away from the idea of a pilot project and is becoming a production unit involved in the reprocessing of the core of the Phenix and, in the near future, in conjunction with the TOR shop, the small-scale reprocessing of the core of the Superphenix.

—the Highly Radioactive Waste Service, which is continuing its work on vitrification of liquid radioactive wastes (SDHA).

—the Industrial Prototypes Service (SPI), which is developing in a non-radioactive atmosphere the principal equipment associated with the UP 3, the future plant to be established at La Hague.

—the Process Industrialization Service, charged with checking and approving AEC reprocessing work.

—the Installation for the Surveillance of Radioactive Assemblies [ISAI] under construction for the Superphenix.

All of these units come under the IRDI (Technological and Industrial Development Reserch Institute). Also present at the Marcoule site are:

—a service coming under the Office of Ionizing Rays (ORIS), which develops, implements, and sells procedures for the medical application of radioactive elements (for more details see Annex 10).

—certain units of less importance which come under the Institute for Nuclear Protection and Security (IPSN):

* the central unit for the dismantling of nuclear installations.

* the laboratory and plant security evaluation service.

* the nuclear security protection and assistance service.

Finally, there is a directorate charged with logistical support. All of the above services employ around 1,000 workers.

1.2 - The COGEMA Establishment at Marcoule

As indicated in the preceding sections, this establishment is charged with supplying the French nuclear striking force with plutonium and with reprocessing irradiated fuel from the "old nuclear systems" of the EDF—that is, the UNGG reactors—in the UP 1 plant which has been in operation since 1958.

It has the following facilities:

—a shop for mechanically removing the shielding from fuel rods, with associated stockpiling pools.

—a reprocessing plant equipped with facilities for handling plutonium for military uses and a unit for the conversion of plutonium into plutonium oxide for civilian uses.

—a shop for the vitrification of highly radioactive liquid effluents (AVM).

Around these production units is a group of other essential shops which provide services both to COGEMA and to the CEN-VALRHO:

—the station for the treatment of effluents.

—the decontamination shop.

—the solid waste compacting shop.

—the analysis laboratory.

—the Radiation Protection Service (SPR).

--the Security Service (FLS).

—administrative and management services.

There are still other services, no less important since, by themselves, they employ about 900 workers, taking care of maintenance, the construction of new units, etc. Finally, let us not forget the G 3 and Celestin reactors, which are devoted to military purposes and which are still functioning.

We note that around the reprocessing plant itself, which operates with about 150 workers, operating 24 hours a day, every day, there is a further group of units which brings the overall total of workers to 2,245 and demonstrates the complexity of the operations.

2 - The Present Situation at Marcoule

2.1 - Reprocessing Radioactive Waste from the UNGG Reactors

The UNGG reactors belong to EDF and are fueled with natural uranium, controlled with graphite rods and cooled with carbon dioxide in gaseous form.

We saw previously that the UP 1 plant at Marcoule took over the reprocessing of the spent fuel from the UNGG reactors from the UP 2 plant at La Hague. The problems related to the rate of combustion of the EDF fuel which the La Hague plant had experienced subsequently came up also at Marcoule and affected the entire process:

* the process of removing the shielding has encountered growing difficulties over the years, and many incidents have occurred, due to mechanical or physical causes, including fuel rods catching fire or exploding, with consequent radioactive contamination of the surrounding area and at times of the workers.

The most recent incident took place on 22 March 1983. There was a fire in the nuclear waste and in the magnesium shielding, followed by a violent explosion which put a premature end to the operation of this installation before the MAR 400 facility was ready to replace it.

The shortfall in the tonnage reprocessed (245 tons planned to be reprocessed in 1983), according to a statement of the directorate of CEN-VALHRO, will amount to at least 100 to 120 tons, provided the startup of the MAR 400 shop goes well.

* The UP 1 plant operated under acceptable conditions for military reprocessing at the low rate of combustion of the G 1, G 2, and G 3 reactors. Since beginning the reprocessing of fuel from the EDF reactors, the plant has also encountered major radiation problems, seriously complicating the maintenance of the installations.

Moreover, this plant went into operation in 1958, and certain, irreplaceable parts essential to its functioning have never had the slightest checkup since that time. It is not clear whether the UP 1 will be able to continue the reprocessing of spent fuel from the "old nuclear reactors" until 1990-1995, which would give it a working life of 37 years. Studies have shown that no one was ready to assume the risk of having it reprocess the Superphenix reactor in the next few years, although at present it is reprocessing the covers of the Phenix reactor under very bad conditions.

* Since the reprocessing of EDF radioactive waste began here, the station for the reprocessing of effluents has rapidly been saturated with radioactive sludge which the shop responsible for coating it with bitumen is no longer able to handle. This is due to the fact that there has been an increase in the rate of combustion and, consequently, in the volume of radioactive sludge in the effluent.

This station is presently functioning under very bad conditions. As it is essential for both the CEN-VALRHO and the COGEMA operation , it is uragent to build another such station. However, it is still necessary for so large an investment to be justified in terms of a future for the center which extends beyond 1985.

At the moment it is intended that a new shop for coating the radioactive sludge with bitumen will be built quickly, because without such action, the Marcoule complex would choke up and be unable to function.

* The vitrification shop: since it went into service this shop has not raised any major problems. As its nominal capacity for vitrification is above the requirements of the UP 1 plant, the time allocated for maintenance operations is sufficient to ensure the satisfactory operation of the installation. However, we note the steady accumulation of technological wastes, and the delicate problem of the overhead gantry, which was not built to nuclear standards and which shows signs of metal fatigue and should be dismantled.

* The other units: they have gone along with the general evolution of the site, in the sense that their activities are closely interdependent. The decontamination shop has been dealing with growing quantities of radioactive materials. The shop for compacting solid wastes is not suitable for wastes contaminated with Alpha particles.

Since 1958 we have also observed a worsening situation in terms of the accumulation of radioactive waste of all kinds at the Marcoule site. This has been one of the consequence of reprocessing irradiated fuel from the EDF:

—the shielding of the fuel rods has accumulated since the beginning of these operations.

—there is a growing number of silos containing barrels of bitumen covered radioactive sludge.

—technological waste has increased in volume, due to the entry into service of the shop for the vitrification of fission products.

—liquid fission products which are vitrified and then stockpiled in pits.

—radioactively contaminated solvents and oil.

—the G 2 reactor has been closed down and awaits dismantling.

—shop 100, formerly the end of the plutonium line in UP 1, has been shut down for many years and contains considerable quantities of plutonium, to which may be added various apparatus dismantled after the end of plutonium production and now contaminated with it; contaminated boxes of gloves, vats, various kinds of equipment, etc.

—many barrels of radioactive waste with a high plutonium content and theoretically available for incinerating and which are waiting for this operation to be carried out. They are stockpiled here or inside the UP 1 reactor.

—ashes rich in plutonium resulting from the incineration of radioactive waste. They are waiting for chemical dissolution and recycling (not much sign of this at present).

—other waste coming from the laboratories.

—concrete contaminated by leaks in the installations.

2.2 - Reprocessing of Phenix Fuel in the SAP [Pilot Shop Service]

* The present production line (TOP), which should have been shut down at the end of July 1983, has never functioned properly. When a new shop for the extraction of plutonium (third plutonium cycle in Cell 65) was placed in service, this shop was faced with one of the hardest jobs for the workers since the establishment of the Marcoule center. It was necessary to cut out a vibrating column in an atmosphere highly contaminated with plutonium! However, the CFDT intervened to postpone this job. The tests made on this column before the installation went critical were cut short for production reasons. Since that time this cell has never functioned properly. It has encountered serious amounts of radiation and contamination of the workers.

The mechanical handling shop of this same installation has experienced major problems, due to the obsolescence of the installations, such as the breakdown of a highly contaminated crane which prevented the operation of the production line for 2 months.

* The new TOR (High Speed Oxide Treatment) line, is due to go into service in 1985 and is now being assembled. There is already reason for concern due to the concept of the TOR 3 shop (in the first extraction cycle), since its complexity and the small space available for it will make servicing very difficult, if not impossible, even before it is placed in operation. The TOR 1 shop has already raised problems, and it is feared that it may be placed in service before the end of the preliminary tests, if it is to begin to function before January 1985.

—The entry into service of this new unit therefore threatens to be problematical, and this will certainly involve considerable problems for the workers who will be assigned to operate it. Moreover, it is regrettable that the workers have practically never been consulted, from the time this unit was first conceived of. However, they will be the ones to bear the burdens of working in that unit.

In view of this situation the CFDT denounces the commercial objectives (bringing in the maximum amount of money to the division) and the publicity devoted to it (showing that we know how to reprocess fuel from a fast breeder reactor). The CFDT further denounces the fact that the AEC has assigned this function to a pilot shop, whose principal function should have been to undertake research and development at a slower rate in terms of reprocessing fuel.

3 - Overall Proposals of the CFDT

3.1 - Overall Situation

We have seen that, apart from the Phenix reactor, all of the activity at Marcoule ultimately depends on a station for the handling of liquid effluents. This station is now almost overwhelmed and has already caused interruptions in production installations, including both COGEMA and AEC facilities.

The former station for removing the shielding from UNGG fuel rods went out of existence, following an explosion of magnesium shielding held in a vibrating transporter and abandoned from September 1982 to March 1983. The CFDT demanded establishment of a committee of inquiry. This facility should have been replaced by a new station for removing the shielding from the fuel rods, called the MAR 400, which will not be able to reprocess radioactive sludge until a new shop is put in place at the head of the UP 1 line, accompanied by a new station for the treatment of effluents.

In May 1983 the reprocessing of spent fuel from the EDF UNGG reactors was totally halted at Marcoule.

The UP 1 plant placed in service in 1958 is threatened with a serious breakdown, which would immediately end the reprocessing of fuel from the EDF UNGG reactors and would involve the paralysis of a large part of the other installations which provide it with support. At present Marcoule is carrying on its activities, balanced on a razor's edge, in the absence of having been provided with the necessary investment funds in a timely manner.

The Pilot Shop Service (SAP-AEC), on which a substantial number of workers also depend for their jobs, was to stop its activities in mid 1983, resuming them with the entry into service of the new TOR installation in 1985. Meanwhile, there will be a problem with the temporary reassignment of the personnel working at this installation. Regarding the longer term, two projects are presently under consideration:

—the MAR 600, a COGEMA unit intended for reprocessing the fuel of the three Superphenix fast breeder reactors.

—the ATALANTE, an AEC research and development unit for the study of the chemistry of reprocessing, intended to replace AEC/DGR installations at Fontenay-aux-Roses (Paris area) which have become obsolete and which are too close to major urban centers.

These two installations, whose entry into service is not anticipated before 1992, also depend in fact on the reprocessing policy which France adopts and on the future of the RNR fast-breeder reactors. The future of the two installations will be closely related to the manner in which the conclusions of the Castaing Commission (under the supervision of the Higher Council of Nuclear Security) are taken into consideration. And we have seen that in this connection the path of wisdom involves taking no hasty action.

Regarding the MAR 600, the following dilemma threatens to come up quickly: should we undertake the construction of this installation as soon as possible, in order to protect employment at Marcoule, whatever the price, or should we wait for the present reprocessing procedures, which are poorly adapted to the long term stockpiling of nuclear waste, to be improved and developed from the industrial point of view? (The problem turns on the need to remove Alpha particles, which will be present in greater quantities in the spent fuel from the RNR reactors.)

3.2 - Proposals by the CFDT

The CFDT and the workers at Marcoule face an extremely complicated problem, which some people simplify in an exaggerated way:

—Ending the short and medium term reprocessing programs and then ensuring the future of the site, which will not only contribute to maintaining jobs at the Marcoule site but will also generate work by subcontractors. In addition, there is the economic impact on the area of the salaries of the workers.

—Adopting the too simple solution of keeping up false hopes such as the construction of four fast breeder reactors, without taking the elementary precaution of including them in a coherent national energy development plan, which would ensure the needs of the country and would take into account all sources of energy, in particular French coal, which, as we previously saw, would be irremediably damaged by too rapid a concentration on nuclear power.

The CFDT is the largest trade union central organization at the Marcoule site, representing almost 40 percent of the workers, including both the AEC and the COGEMA installations. It is one of six trade union organizations represented there. It is the only organization to adopt a policy of truth, precision, and solidarity.

—Truth about the real difficulties involved in the reprocessing of radioactive fuels.

—Precision regarding the manner of considering the problems which are posed simultaneously by the international crisis; the national energy situation; whether the present AEC strategy is well-considered; the reprocessing of nuclear waste, whose industrial feasibility has not been demonstrated; and the handling of nuclear wastes.

—Solidarity among the workers in different sectors of French energy production. They are presently in competition with each other. Let us mention coal as against nuclear energy, both with their train of employment problems. For several years the CFDT trade union at Marcoule has alerted the various directorates and authorities to the precarious situation at the site. As it has been aware of the limitations on its means for investigation into the matter, it has also asked for several years for a committee of experts to come to Marcoule to conduct an inquiry in order to develop an overall view of the situation. This should be done to bring out, through discussions with the workers and their trade unions, credible proposals for the future. This initiative by the CFDT has not yet met with the positive response which the trade union hoped for.

With the entry into power of a government of the Left and the remarkable work of the Castaing Commission the CFDT, through its National Atomic Energy Union (SNPEA/CFDT) and the CFDT itself, reiterates its demand for a "Castaing type" commission to the chairman of the Higher Council of Nuclear Security. Only time will tell whether this demand has been given consideration.

For its part the directorate general of COGEMA, no doubt very concerned about the future of reprocessing of spent fuel from the PWR reactors at La Hague, which

will require enormous investments and will raise financial problems, has turned a deaf ear to problems concerning Marcoule and has refused to enter into direct contact with the CFDT. He has done this in order to undermine and cut short the discussions.

In view of this situation the CFDT thinks that the proposals of the Castaing Commission should be applied to the Marcoule site without delay and followed up by measures that take into account the technical and historical characteristics that pertain to it:

—Reexamine the notion of national defense secrets, with the restrictions on free access to information which they involve, so that such important facts as the rate of loss of plutonium in the nuclear waste or the security reports on the installations will be available to any organization which asks for them. In the same way it should be possible to declassify certain installations (the processing of nuclear waste, for example) which have no "confidential military" aspects about them, in order to facilitate discussion.

—Undertake a cleanup of the site. That is, after an exhaustive inquiry into all the waste that has accumulated since the Marcoule site was established, look into and undertake the treatment necessary for the proper handling of this waste material in a definitive way, or at least a temporary way, with a possible resumption of work if no presently available technical solution is appropriate for the long term. This effort may require substantial, technological resources, as well as considerable amounts of labor. It may be necessary to build new units for this essential reprocessing of nuclear waste.

—Ensuring an end to reprocessing of spent fuel from the UNGG reactors. It may be necessary to close down the UP 1 plant, either to clean things up (one unit has been closed down for several years, due to a substantial level of radioactive contamination), or to update or construct new facilities in order to avoid a definitive halt in activities due to an event like the "22 March 1983" incident in removing the shielding from spent fuel rods.

—Ensuring proper treatment of liquid effluents: the present station is constantly overwhelmed with work and will not last until the 1990-95 time frame. In the same spirit as that mentioned above, let us envisage a "cleanup" of the accumulated nuclear waste and, above all, expedite the constructin of a new station. In parallel fashion let us consider and do whatever is possible to recycle liquid effluents in the plants (the UP 1 or the SAP) or in the laboratories.

—In terms of removing the shielding from the spent fuel rods, after the conclusion of the ongoing inquiry requested by the CFDT, do everything necessary to ensure that the new MAR 400, which has not yet completed its tests, is brought into operation.

—Improvements in present procedures: although studies have been conducted in other centers, particularly in Fontenay-aux-Roses, certain complementary work can be conducted in Marcoule by the Chemical Engineering Section of the Production Services, the Bureaus of Research, and the ACE-SAP and SPI services involved.

--Marcoule can also make its contribution to determining the character of the nuclear waste contaminated by Alpha particles, through the experience acquired in the refined plutonium shops of UP 1 and the SAP.

--Study of compacting waste products: Marcoule could undertake a pilot project to study the absorption by the plant itself of its own waste products which could be immediately reconditioned without a need for transportation and handling which is dangerous to the workers and the environment. This kind of installation could be set up on an industrial scale at the UP 3 plant at La Hague.

--Vitrification of fission products: improve the resistance to leaching of the glass products presently used and seriously consider the long term future of the transuranian content in the glass products in the course of fabrication.

--Conditioning containers and connecting tubing for precipitated, radioactive sludge: accelerate studies on the industrial application of processes to replace concrete and bitumen forms now in use (automated fusion into hollow shapes and the use of ceramics so that these can be adapted to future plants--such as the UP 3 and the MAR 600).

--Operation of plants: prepare as quickly as possible a list of incidents, usable both by COGEMA units (UP 2 plant, Works Control Service at the UP 3 plant) and by the AEC, so that all experience obtained from operations can be made use of.

--Development of robotics for nuclear plant applications: creation of a test room for assembling and disassembling units, using telecommunications guidance.

Activities not related to the reprocessing of fuels:

These are presently rather marginal, due to the number of workers they involve. However, they could be developed in a more significant way, in order to diversify activities at a given site and make them less vulnerable to passing phenomena. In effect, there is a potential in this direction, and the resources required to develop this potential are not very substantial (less major investment than in fuel reprocessing). The principal units concerned are:

--ORIS [Office of Ionizing Rays], where the development of the Product Laboratory for Medical Analysis [LAPAM] should include:

* strengthening the radiation/immunological sector.

* new activities applying other, non radioactive techniques for medical analysis in vitro.

* development and fabrication of automated apparatus using biomedical products.

The future of this service, although initially promising, because there is a social need for it, may risk raising some concern among the personnel. Because it is considered "commercially viable," this activity is receiving less and less attention within the AEC-ERIES, a partnership between the AEC and ROBATEL-SLPI. This group will probably be transformed into a subsidiary of the AEC, with capital from the AEC, SGN, EPICEA, etc. This company has always operated with small

resources, mostly provided by the Chemical Engineering Group (GGC) of SAP-AEC. Its area of activity covers:

—the extraction of liquids from liquids and of solids from liquids.

—filtration.

—cracking complex compounds.

—distillation.

It has found outlets in:

—cleaning up pollution: removing phenol compounds, recovering acids, etc.

—the chemical industry: carbon and petroleum chemistry, industrial pharmaceuticals, precious metals, hydrometallurgy involving copper, nickel, chromium, uranium, etc.

—the agricultural and food industry: extraction and purification of vegetable oils, proteins, coloring agents, etc.

—improving the quality of biomass.

Clearly, such a spectrum of activities could lead to important work. However, to do that it would be necessary, in addition to the necessary economic resources, to have the support of a political will to diversify and open out to the world and flexibility in adaptation and organization which the AEC and COGEMA at Marcoule show few signs of having. However, projects which should be encouraged are under way in this direction:

—the treatment of deep sea nodules.

—the construction of an agricultural and food platform in the sea.

Conclusion: the proposals of the CFDT, although they are not exhaustive, have the advantage of already existing. They still need to be discussed, which has never really taken place. Certain work would cost a great deal and would take time. This is one reason more for undertaking immediately work on projects whose urgency is clear to all. After 25 years of activities essentially oriented toward the military requirements of the nuclear striking force, the Marcoule site can look toward another future.

This future, between now and the year 2000, will involve reprocessing of nuclear fuel, the segregation and handling of nuclear waste, the extension of activities of a non nuclear character, and the contribution of the site to regional development.

CONCLUSION

For more than 10 years the National Atomic Energy Union of the CFDT and the confederation itself, through publications (such as the "Dossier Electronucleaire en

France" [The Question of the Nuclear Generation of Electricity in France], films, and lectures, have tried to open up the subject for public debate.

The CFDT local union in Marcoule, which was not very sensitive to the implications of the arrival of EDF nuclear fuel at the site in 1973-74, has since become aware of the seriousness of the situation. Since then, more and more clearly with the passage of time, the point has been reached where the situation at the site, its current status, and its future were the essential aspects of the debates at the CFDT General Assembly of 30 April 1983.

It was after this assembly that the members of the CFDT union at Marcoule, meeting for an entire day, made the decision to provide more information to all of the workers at the site.

In effect the members of the CFDT union, whether they are engaged in decontamination or operations, whether working on the removal of shielding or in the reprocessing plant, whether they are technicians or engineers, whether they are chemists or mechanics, whether they are functional or maintenance personnel, share the same opinion:

—the situation at Marcoule is precarious. The situation must be brought out more clearly. The condition of the site must be described. It must be discussed. The situation must be made known and brought out of the narrow circle of those who have been initiated into its mysteries. Any solution must involve this.

This pamphlet is therefore not the product of a few militant members of the union but rather it represents the contribution of the CFDT union at Marcoule to the debate on energy and nuclear problems on which the future of the site depends.

The CFDT union, although it is the largest union at the site, does not intend to act as a pressure group to impose a kind of solution by means of force or slogans. It intends to make its contribution to the debate and to make the workers and the authorities aware of the problems existing at the Marcoule site. These problems must be solved if, like the CFDT, the site is to have a future.

If the authorities are unwilling to enter into a discussion, they will be assuming historic responsibilities which may go against the interests of the country and of the generations to come.

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SUCCESS OF URENCO CENTRIFUGE PLANT IN ALMELO

Profitable Operations

Amsterdam ELSEVIERS WEEKBLAD in Dutch 1 Sep 84 pp 14-15

[Article by Piet de Wit: "Ultracentrifuge Plant in Almelo Is Producing Unexpectedly Rapid Results"; passages enclosed in slantlines, printed in italics]

> [Text] Dark clouds over the development of nuclear energy. Hence also dark clouds over uranium enrichment in Almelo? Not in the least. The UCN [Ultracentrifuge Netherlands] is starting to emerge as an extremely profitable enterprise. The Dutch-British-German enrichment troika is still unique, but today Japan and America are also building ultrafast centrifuge plants.

What started more than 40 years ago for the spiritual father of ultracentrifuge, Professor J. Kistemaker, as a mental exercise far beyond the limits of the technological knowledge of the time, has since then become a commercial factory where a profit was made for the first time last year.

Even though the name Kistemaker will remain indelibly attached to the ultracentrifuge technique, he was -- as is true for virtually all inventions -- certainly not the only father of this method of uranium enrichment. While Kistemaker toiled on at the Amsterdam laboratory for mass separation of the Foundation for Fundamental Research on Matter [FOM], scientists in Great Britain and Germany were on an identical track.

Before the war already, the Americans had also started thinking about the separation of U235 and U238 via ultracentrifuge, but in their hurry to manufacture a nuclear weapon they shifted to the method of gaseous diffusion.

In the sixties, under the influence of "Atoms for Peace," people in the Netherlands, the FRG and Great Britain began to realize that "strong together" could also apply to the ultracentrifuge. On 25 November 1968 the three countries officially decided to begin cooperating. The completion of the agreement took another year because of, among other things, ethical objections on the part of some Dutch politicians who thought that in this way the Netherlands might provide the British with technological knowledge which could also be used to manufacture nuclear arms, and there was also some hesitation

because at that time the Germans had not yet signed the non-proliferation treaty.

Matters were settled, and on 4 March 1970 the /Treaty of Almelo/ was signed whereby the three countries decided under strict conditions to build the three enrichment plants. Another year later, the treaty was officially ratified by the member states.

Fission Material

In 1938 it had already been discovered that atoms from the element uranium wer fissionable. Uranium occurs in nature with a mass of 235 and 238 (in a proportion of 1 to 140); U235 is fissionable. In order for a nuclear power plant to run well, fission material with 3 percent U235 is needed, whereas only 0.7 percent U235 is found in its natural composition.

In centrifuges the heavier particles of U238 are separated from the somewhat lighter U235. Only about one-fifth part U235 is added by centrifuge. The enriched fraction then includes 6/5 x 0.7 percent U235, and the reduced fraction 4/5 x 0.7 percent U235.

Hence, in order to end up with 3 percent U235, 8 successive passages through the centrifuge are needed, a /cascade/. If many more passages are added, then uranium can be enriched this way to the 90 to 94 percent U235 needed to manufacture a nuclear bomb. But supervision of this is simple.

The Treaty of Almelo stated, among other things, that an enrichment plant would be built in each of the three participating countries. In addition to Almelo there was the British Capenhurst and the German Gronau, right across the border near Enschede. Meanwhile, Almelo is the largest. The established capacity is 700 tons of separation per year. In Capenhurst the capacity is 400 tons and they are still working on the Gronau plant (the three complexes are identical). A year from now, the first centrifuges will also be spinning there.

The lay-out of all three plants is geared to a capacity of 1,000 tons of separative work unit [SWU]. For Almedo, there is an additional 200 ton capacity from a demonstration plant which began to operate in 1977.

For political reasons it was not deemed wise to build a test plant on West German soil, and thus German activities involving ultracentrifuge have so far been carried out in Almelo. There is a separate German test plant in the field, they participated on an equal basis in the demonstration plant, and there is also a separate German centrifuge capacity in the actual enrichment plant.

Final Goal

The final goal within the whole URENCO [Uranium Enrichment Consortium] is to have three identical plants, each with a capacity of 1,000 tons, more or less depending on orders placed by the joint sales and marketing apparatus URENCO, Limited, located in Marlow, England.

On the world market for uranium enrichment, URENCO is a small companv next to big brothers France (Eurodif, in which Belgium, Spain and Italy also participate) and the Americans via their United States Department of Energy factories.

By the end of this year, the Americans will have 27,300 tons of commercial enrichment capacity available; Eurodif -- the Tricastin plant -- has set up a capacity of 10,800 tons, URENCO 1,300 tons, and the Soviets have an export capacity of 3,000 tons via their Technabsport company. All together 42,400 tons, and at the moment the Americans and Eurodif use barely half of it.

The use level of URENCO is close to 100 percent. It is the result of the substantial difference between enrichment via ultracentrifuge and via gaseous diffusion, the method used by the Russians, the French and the Americans.

With gaseous diffusion they make use of the physical fact that light gas molecules (U235 in the form of the gas UF6, uranium hexafluoride) will penetrate more quickly through a porous wall than will the heavier U238.

Uranium hexafluoride is kept in solid state in (gross) 15 ton containers. It becomes gaseous only at 80 degrees Celsius. The cargo which was lost along the Belgian coast in the sunken ship Mont Louis is no more radioactive than newly mined uraniun ore.

The ore -- the property of an electric power company -- is combined with fluorine in a conversion plant. In the case of the Mont Louis, this process had taken place at Pierrelatte in France. Next it was -- still the property of the electric power company which would use it later in a power station -- under way to the Soviet union where it would have been turned into low-enriched uranium by gaseous diffusion.

Following this phase, the enriched uranium is converted somewhere else again into uranium oxide (UO_2). This is pressed into small pellets, which are stacked together to form fuel rods. It is only when these rods start their chain reaction in a nuclear power plant that they become highly radioactive.

Even in case of leakage, the UF6 in the containers at the bottom of the sea (12 pounds content, 3 tons steel capsule) would produce relatively little fluorine contamination. Under water the fluoride forms a crust around the UF6.

Energy

The disadvantage of the gaseous diffusion method is the much greater energy consumption. For example, there are four large nuclear power stations near Tricastin (each with a capacity of about 900 megawatts) to provide energy for the diffusion process. Hence, as the plant is working only at half capacity there is a question not only of under-utilization of the capital invested in the plant, but two nuclear power stations also produce "needless" electric current for Electricite de France.

URENCO's newest centrifuges, as they are currently being installed in Almelo, use 60 kilowatt/hours per kilogram of enrichment work, whereas the gaseous diffusion method would require 2,400 kilowatt/hours for it, 40 times more.

Furthermore, gaseous diffusion plants must be built at one time, and because the total project time requires at least 6 to 8 years, the capacity is determined by market forecasts which may prove dramatically inaccurate at the time of completion.

How dramatic is shown by the forecasts made by various clients as late as 1976, that by 1990 the world could be facing a 30,000 ton deficit in its enrichment capacity. With a world surplus of at least 20,000 tons, such a forecast seems at least careless.

Unlike diffusion plants, ultracentrifuge plants are built piece by piece. The technology makes it possible for the URENCO partners first to conclude contracts, and only afterwards to determine the centrifuge capacity. The contracts are for a 10 year duration, the same as the technical and commercial life span of the centrifuge. This way, theoretically URENCO always produces with a 100 percent level of use.

Hence, the two factors of low energy consumption and 100 percent use together should give URENCO a tremendously strong market position. If it were not for the fact that it involves a very special market. First of all, strategic considerations apply. It is only since last year that American electricity producers have been able to purchase a maximum of 30 percent of their low-enriched uranium from sources other than their own Department of Energy. This has opened a market for URENCO which thus far had been closed.

However, the separate position of URENCO also has another consequence. Because the world prices have been determined historically by the large -- but expensive -- suppliers America and Eurodif, "Tom Thumb" URENCO is able to make good margins with its enrichment work.

This is reflected in the results booked by URENCO Netherlands VoF [Enrichment Plant], the actual enrichment plant. In 1981 -- which was clearly still a starting-up year -- with a turnover of 55 million guilders, they earned 200,000 guilders net.

In 1982, they made a net profit of 40.9 million guilders with a turnover of 169 million guilders, and in 1983 they had a clear profit of 52.7 million guilders with a turnover of 154 million guilders. This way, URENCO Netherlands made a net profit last year of 34 percent of its turnover.

This is a distorted picture, because the whole item of Research and Development, the manufacturing of the centrifuge and the management are grouped under Ultracentrifuge Netherlands, Limited [UCN]. But substantially earlier than expected, the UCN also began to make profits last year. After having still registered a loss of 8 million guilders in 1982, the year 1983 closed with a net profit of 2.1 million guilders. Now that we are talking about distorted pictures anyhow, let us add a word of explanation about the UCN profits: in the seventies, the government made available for nothing -- via the Ministry of Economic Affairs -- a total of about 250 million guilders for Research and Development. In addition, the state paid for the test plant and the demonstration plant. Late last year, those amounts -- together 161 million guilders -- were converted into

capital stock. As a result, the state has a 98 percent interest in UCN, Limited. The remainder is in the hands of companies which at the time stood at the cradle of the development: Philips, RSV [Rhine-Scheldt-Verolme], Shell, DSM [expansion unknown], and VMP [expansion unknown].

Secrets

Throughout the years, fierce storms have raged over and around the UCN. The intended delivery of low-enriched uranium to Brazil nearly brought down the Van Agt administration in 1978, and a year later followed the humiliating disclosure that the Pakistani scientist Dr Abdel Khan had passed on secrets from inside (via VMF subsidiary FDO [expansion unknown] and for a few weeks even from Almelo) about th? ultracentrifuge process to his country.

The importance of Khan's role is proven much more by the fact that the current Pakistani ultracentrifuge project -- a test plant near Kahuta -- was named after him than by the fact that the Amsterdam court sentenced him in October 1983 -- in absentia -- to 4 years in prison. Not because it was proven that Khan had stolen secrets from the Netherlands, but because later on he tried to induce two former colleagues in writing to provide information. The fact that such a heavy sentence was imposed in spite of the legally flimsy charge, seems an indication of the frustration felt by many people that Khan had been able to look into the kitchen unhindered for nearly 3 years.

The Khan affair -- ultracentrifuge in the hands of a country which wants to use it to make an atomic bomb -- has also placed the Almelo company in the front of th storm line for the declared opponents of everything related to nuclear fission. Various officials in Almelo have relics in their rooms, such as chains, padlocks or crow feet, from some surrounding or blockade action or other.

Outwardly, the security of the Almelo complex is impressive. A double gate with cameras in between and a separate radar detection system. In addition, the outside gate also has a signaling system which transmits vibrations.

At the time of their hiring, workers are subjected to a security check, but -- correct observation -- this was also done with Khan. A visit to the plants is not allowed unless official permission has been granted by the Joint Committee, the representatives of the three governments. It is also this Joint Committee -- hence, the governments -- which determines whether or not they can deliver to certain countries.

URENCO still tries to keep as much of the technical accomplishments of the plant secret as possible. And this for commercial reasons. The process of enrichment via ultracentrifuge is generally known, but how to build centrifuges which will spin around for 10 years, without any maintenance needs, at a speed of about 100,000 rotations per minute (this is, in fact, not an official figure; the number of rotations is a secret), is an industrial process which only a few people know.

And not a single picture provided by UCN or by another URENCO company shows a complete centrifuge. So that there is not much more to tell about a centrifuge

than that it had a diameter of about 50 centimeters and was a little more than 2 meters high. Meanwhile, many tens of thousands of [illegible] are silently doing their job in Almelo.

Ultracentrifuge is an absolutely clean industrial process. It does not release any contaminated air or water and on the outside there is never any question of radioactive radiation. The remaining spent uranium is kept in case uranium prices go up so much that it is worth the cost to extract the last remnant (0.25 percent) of U235 by centrifuge.

There is only one group of people for whom all the doors open up in the enrichment plant: the inspectors of the International Atomic Agency, a United Nations institution with headquarters in Vienna.

At irregular times -- in recent years, about 10 to 11 times a year, a group of four -- alternating -- officials visit the plant to see whether they are clandestinely producing high-enriched uranium after all. They read sealed mass spectrometers, perform measurements themselves and a couple of days later they take off again. So that the world may know once again that the Netherlands is not in the process of building nuclear bombs...

URENCO Neutrality

Amsterdam ELSEVIERS WEEKBLAD in Dutch 7 Aug 82 p [illegible]

[Article: "URENCO: European but With a [illegible]"]

[Text] The URENCO troika is one of the [illegible] European enterprises. The structure bears the marks of it. A [illegible] to the maze.

BNFL = British Nuclear Fuels. Government enterprise, [illegible] URENCO UK enrichment plant in Capenhurst. [illegible] centrifuges.

UCN = Ultracentrifuge Netherlands. Government [illegible] 98 percent. Up to the first 2000 tons of production capacity, UCN [illegible] URENCO Netherlands enrichment plant in Almelo [illegible] 50 percent. [illegible] into the plant in Almelo."

Uranit [illegible] building the enrichment plant in Gronau [illegible] URENCO [illegible]

URENCO [illegible] URENCO Netherlands [illegible] for UCN and Uranit.

1. [illegible]

GnV = Gesellschaft für nukleare Verfahrenstechnik [Company for Nuclear Technology Processes]. Combination of the mechanical engineering plant MAN and the firm of consulting engineers INTERATOM. Is building centrifuges at MAN in Munich, for the Gronau enrichment plant.

CENTEC = Gesellschaft für Centrifugentechnik [Company for Centrifuge Technology]. Patentee of everything connected with ultracentrifuge and URENCO, located in Bergisch-Gladback. Has same management as URENCO, Limited.

URENCO, Limited = joint marketing and sales company of enrichment activities by BNFL, UCN and Uranit, located in Marlow (near London).

Director Interviewed

Amsterdam ELSEVIERS WEEKBLAD in Dutch 1 Sep 84 pp 16-17

[Interview with Willem H.J. Tieleman, president of the board of directors of UCN and former director general of the Energy Department in the Ministry of Economic Affairs: "Uranium from Namibia? We Have Nothing To Do with That"]

> [Text] At the time, he was one of the first top officials to leave the Ministry of Economic Affairs. Former Director General (Department of Energy) Willem H.J. Tieleman became, in December 1982, president of the board of directors of UCN. Well known territory for Tieleman, because before that he was a commissioner with the company.
>
> "Did I leave because of the pay, which is made so much of now?" He carefully leaves this unanswered. "The most important reason was that after 20 years I felt I had had enough of it. And then another 20 years, no, the thought alone was too much for me."

Question: When you look at the rather sad state of affairs in the world concerning nuclear energy, you would expect repercussions of it on URENCO, wouldn't you?

Tieleman: Actually, there is a sad state of affairs only in the United States. The FRG is developing steadily, Japan is continuing; in France there is talk of temporizing, but the current program is simply being carried out. And even though there are barely any new orders for nuclear power plants in America -- some have even been canceled --, at least 50 power stations are still under construction.

Question: Do you see America as a potential market for URENCO?

Tieleman: The absolute monopoly position of their Department of Energy has now been broken and as a result, our marketing activities there now are many times what they used to be. As a matter of fact, our French colleagues are working at it equally hard and DOE is itself, of course, fighting to the death to maintain its home market.

Question: The diffusion technology is much more expensive than ultracentrifuge. And yet, Eurodif and the Americans are big competitors of URENCO. How is that possible?

Tieleman: At the present time the Americans are clearly the most expensive suppliers in the world. And the French also have high prices. However, in the market you see them take very marginal price positions in order to hang onto their markets in any case.

Question: How great is the price difference?

Tieleman: (A great deal of hesitation by Tieleman.) Well, now, a shot in the dark. There is no good answer to that question. At the present time, the Americans are quoting $135 for 1 kilogram of separative work unit. But there are very reputable institutions in America, such as the General Accounting Office, which say that the cost price has already reached $160. And yet they go on the market with that $135. Now, that is a price we should be able to stay a few percentage points below.

Margin

Question: Last year, URENCO Netherlands delivered 440 tons for 154 million guilders. That is 350 guilders per kilogram. The previous year, URENCO delivered 550 tons for 169 million guilders; that is 307 guilders per kilogram. In a market with so much surplus capacity, you have still been able to broaden your margins substantially.

Tieleman: Yes, very handsomely. Through renegotiations and price reviews, we managed to improve prices in a number of contracts.

Question: You must have been a good bit below the price of the competition to be able to effect this price hike so easily, weren't you?

Tieleman: It is only on the basis of the rules laid down in the contracts that we can effect a price review. But we did indeed have such a round last year.

Question: Last year also, Brazil suddenly no longer bought any low-enriched uranium. What is happening with that now?

Tieleman: Within the framework of the contract, financing agreements had been agreed on which, in turn, were covered by credit insurors. Hence, the Brazilians do not pay us directly; they receive loans and have to repay them. Last year, the government company Nuclebras was no longer able to do that, as a result of which the financing system ran aground. At that point we stopped making deliveries. In fact, that amount was delivered to Brazil this year. The volume remained the same; the only thing is that the contract has been pushed forward in time.

Question: The annual report states that URENCO has a portfolio of 7 billion guilders in orders. At 350 guilders per kilogram that means 20,000 tons then.

Tieleman: Overall, your calculation is right. We are in a very good position in the troika countries. We have about 90 percent of the British market, 60 percent of the German market, and now 100 percent of the Dutch market.

Question: The three countries run energy programs which by 1990 will produce a set capacity of between 36,000 and 39,800 megawatts. At 100 percent market cover by URENCO, this would require between 3,600 and 3,980 tons of separative work unit per year. Meanwhile you have also a Brazilian and a Swiss contract. Together, this will be quite a bit more than the 3,000 tons URENCO plans to build.

Tieleman: Well now, I don't believe that we will achieve 100 percent. Electric power companies always have diversification high on their priority list. In the FRG, there are also quite a number of American and Russian contracts, and a contract has even been concluded there recently with our competitor Eurodif.

Making Money

Question: Should URENCO be seen as a purely commercial enterprise, fighting to take a share of the market away from others?

Tieleman: When it involves countries which our three governments allow us to do business with, then we certainly try to conquer a share of the market from our competitors. We are trying to make money.

Question: There is obviously a great deal of money to be made with it, given profits amounting to 34 percent of the turnover for primary enrichment.

Tieleman: You should, of course, look at the results of the whole UCN enterprise. But in and of itself, it is true that if the turnover of URENCO Netherlands increases, if economies of scale work, the costs will not keep in step. It can indeed become a lucrative business.

Question: In the past, rather large figures have been mentioned concerning employment at UCN. In 1978 they were still talking of 1,200 direct jobs and another 1,200 indirect jobs. However, there are only 600.

Tieleman: Perhaps there was a good story behind it at the time, but when I am asked whether I still expect an enormous expansion of jobs here, then no, I don't expect that.

Question: What could be the industrial spin-off of UCN?

Tieleman: We are, of course, extremely cautious with the selling of our nuclear knowledge. On the one hand, because of the principle of non-proliferation, but also because we have no need for our knowledge to get into the hands of our commercial competitors.

Spin-off is a subject which our enterprise is fully involved with, but of which we also know that it is not easy to score with it. There was a time when everyone said that UCN could make itself socially more acceptable through spin-offs. Well now, that is an extremely good argument, but not enough to simply start taking on everything.

Question: What is UCN excellent in?

Tieleman: In vacuum technology, in chipless and metal-removing transformation, in rapidly rotating components, in gas flow techniques and in connecting techniques. We are able to make extremely nice joints.

We do have diversification as company policy, but we have already experienced a few serious disappointments in this regard. As a result, we know that it is not a simple matter. In the past, we mentioned certain medical applications as an area. But that is off.

Namibia

Question: Does UCN process uranium from Namibia?

Tieleman: I occasionally make a comparison with a white gasoline pump. As if you were asking the owner of the filling station to guarantee that there is no oil from Iran, for example, in it. "How do I know," he would say. Uranium is mined; it goes to a conversion plant where they turn it into UF_6, and then it comes here. The stuff is bought by and is the property of the electricity producer. We are completely out of it, we are enrichers for hire.

Question: Has political pressure been applied on you to find out where the uranium comes from?

Tieleman: Yes, but not directly. Pressure has been applied on the government and it has said that it cannot do that.

Question: But if a client were to simply tell you that the uranium came from the Rossing mine in Namibia. What would you do then?

Tieleman: What would I do? In such a situation, I don't know. Really, talking about this doesn't make sense. What has happened lately in the United Nations? There people have turned to the three URENCO governments. I felt that this was an extremely weak card for the United Nations to play. They were totally unable to get a grip on that uranium production in Namibia, and they felt they had to do something. For lack of anything else, they ended up [illegible] he three urenco governments. And they are rather curious governments, [illegible] it informally. Let us ask them to declare that no uranium from Namibia [illegible] ng processed in the URENCO plants. Well now, this was without any rhyme [illegible] ason. It was precisely of the very smallest enrichment company in the world that they asked this. It was a reasoning of sorts. This is expressed rather undiplomatically on my part, but I am not willing to participate in those kinds of processes.

Question: What is your estimate of the development of nuclear energy in the world?

Tieleman: It will primarily be a question of how the total demand for energy develops. When you see the current American growth figures and if the rest of the world also begins to develop economically, then you get a situation where all kinds of prognoses about energy consumption, which were first adjusted downward dramatically, will go up again. In this respect, people will continue to be extraordinarily careful with oil, and objections to coal will increasingly go up. Then I would certainly not exclude the possibility of nuclear energy once again becoming very attractive in the nineties. I am certainly not pessimistic about it.

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SECURE FUEL BURIAL METHOD SPARKS RENEWED NUCLEAR POWER DEBATE

Helsinki SUOMEN KUVALEHTI in Finnish 5 Oct 84 pp 83-85

[Article by Antti Ruuskanen: "Sweden Starts Up Its New Nuclear Power Plants"]

[Text] A comprehensive report and a thorough discussion of it are in the background of the startup of Forsmark 3, Sweden's 11th nuclear power plant. The government stated that the nuclear waste problem has now been solved in a manner acceptable from the standpoint of safety.

Strong opposition cast a shadow on Swedish nuclear power plants a decade ago. Nuclear power became a general political issue, and the discussion for and against it raged loud and clear.

In accordance with the so-called Nuclear Power Plant Act that went into effect in 1977, nuclear reactors could not be loaded with uranium fuel until a completely safe solution to the problem of nuclear waste had been demonstrated.

More generally, the demand for complete safety in connection with the exploitation of nuclear power hit the nuclear power field in a tender spot. After all, nuclear power had long been marketed as ideal and problem-free. Nuclear engineers proud of their field talked themselves hoarse here and elsewhere in praise of the perfect and definitive solution to the energy problem. The stringent Nuclear Power Plant Act and the referendum which followed it in the autumn of 1980 had a cooling effect on the attitudes of the nuclear power industry in our country as well.

Complete Safety

The demand for complete safety shifted the discussion to the absolute level where nuclear power had to be able to prove it was safe, regardless of how safe other electricity production was, for example.

The prospect for complete safety is unrealistic, however. Nuclear power's drawbacks are linked, namely, to radioactive substances and to the effects which the radiation they emit have on health. Although the risks of radiation have been known since the start of the century, mostly on the basis of the

medical use of radiation, today it is still not known exactly whether small doses of radiation are hazardous or harmless. By small doses of radiation is meant doses resulting from background radiation or even smaller ones.

Radiation protection is based on the idea that small doses are also harmful, but the harm depends on the size of the dose. According to this line of thinking, no absolutely safe level exists; instead, we find ourselves discussing acceptable risk. Once again, this is a relative concept, and the basis of comparison is society's general risk level. For this reason, for example, in our country's legislation the radiation dose limits for workers are set at a level which corresponds to the risk level of professions generally considered safe.

All in all, the Nuclear Power Plant Act's wording proved to be unsuccessful. Accordingly, the entire law gave way to the nuclear technology law in February of this year. The spirit of the Nuclear Power Plant Act was transferred to the nuclear technology law, but the Swedes became more realistic with respect to the wording. The laws in effect at this moment in Sweden read that no new nuclear power plant may be loaded with uranium fuel until the reactor's owner has shown that there is a method to treat and bury used fuel and nuclear waste which can be accepted from the standpoint of both safety and radiation protection. At the same time, the reactor's owner is obliged to undertake research and development work, so that the nuclear wastes can be safely treated and buried in due course.

New Report on Waste

In March 1983, the Swedish power companies sought permission from the government to load nuclear fuel into the Forsmark 3 and Oskarshamn III reactors. At the same time, the power companies submitted to the government a comprehensive report on the treatment of used fuel and nuclear wastes. The name of the report is "The Final Stage of Nuclear Fuel Circulation--Used Fuel--KBS-3."

After legal complications, the Swedish government granted startup permits on 28 June of this year. The startup of Forsmark 3 will probably be the middle of this month, and Oskarshamn III's turn will come at the end of the year.

Before the startup permits were granted, the KBS-3 report became the object of a comprehensive examination. Swedish authorities in radiation protection, nuclear power and nuclear waste formed a heavyweight threesome to pronounce judgment. In addition to them, opinions were requested from some 20 Swedish universities, colleges, science academies and research institutes. Included were the prestigious universities in Uppsala, Lund, Goteborg, Stockholm, Umea and Linkoping as well as Swedish geological and geotechnical institutes.

The Swedes were not satisfied merely with their own experts. Opinions were also requested from more than 10 foreign specialists. Included were expert UN and OECD organizations as well as authorities and research institutes in Canada, France, Great Britain and the United States.

Temporary Repository Soon Ready

Highly radioactive fuel used in the KBS-3 method will be temporarily stored for about 40 years in a joint repository which is nearly ready in the bedrock of the Oskarshamn nuclear power plant. Fuel used afterwards is packed into long copper cylinders.

The copper packets are placed in vertical holes in the base of tunnels blasted into the basement rock at a depth of roughly 500 meters. The holes are filled with a special clay, bentonite. When all the nuclear waste has been placed in the holes, the tunnels are filled and the burial space is closed.

When the holes are closed, groundwater starts to fill the empty spaces left in the rock. The bentonite clay begins to swell when it is penetrated by moisture. The clay thickens into a nearly watertight shield around the waste packets. However, a small amount of groundwater always reaches the surface of the copper.

Although copper is particularly rust-resistant, it does begin to corrode over long periods of time. It is ultimately to be expected that the copper cylinders will rust through and water will soak the nuclear waste. Nuclear waste dissolves very poorly in water, but it is nevertheless predictable that small amounts of waste will get into the groundwater.

Groundwater moves along cracks in the rock. The movement is comparatively slow, and substances dissolved in the water tend to stick to the surfaces of the cracks, which thus slow down the movement of nuclear wastes toward the surface layers of groundwater.

The safety of the KBS-3 method is based on the idea that the phenomena in the rock are so slow that the waste's radioactive substances manage to decompose to an insignificantly low level before the water comes into contact with them.

Firmly Pessimistic

The radiation doses resulting from treatment and burial of wastes are explained in the safety surveys of the KBS-3 report. The acceptablility of the entire treatment setup is weighed on the basis of it.

While checking safety figures, the authorities found several places in which the computational models or assumptions used by the power companies were certainly not pessimistic. When these were replaced with firmly pessimistic assumptions, the radiation doses resulting from burial of wastes grew by a factor of 100. But because these hundredfold radiation doses also remained acceptably small, the authorities felt that the suggested method is on the whole acceptable from the standpoint of radiation protection.

On the basis of the KBS-3 report and the opinions given of it, the Swedish government concluded that nuclear waste treatment can be carried out in a manner acceptable from the standpoint of safety and radiation protection. In connection with comprehensive inspection rounds, however, certain details were revealed whose clarification will require future research.

The comprehensive Swedish reports have raised our western neighbor's nuclear waste researchers to the world's top level. It is no wonder that the primary financial backers of the research, Swedish power companies, have established a company to market knowledge about nuclear waste abroad--in Finland, too.

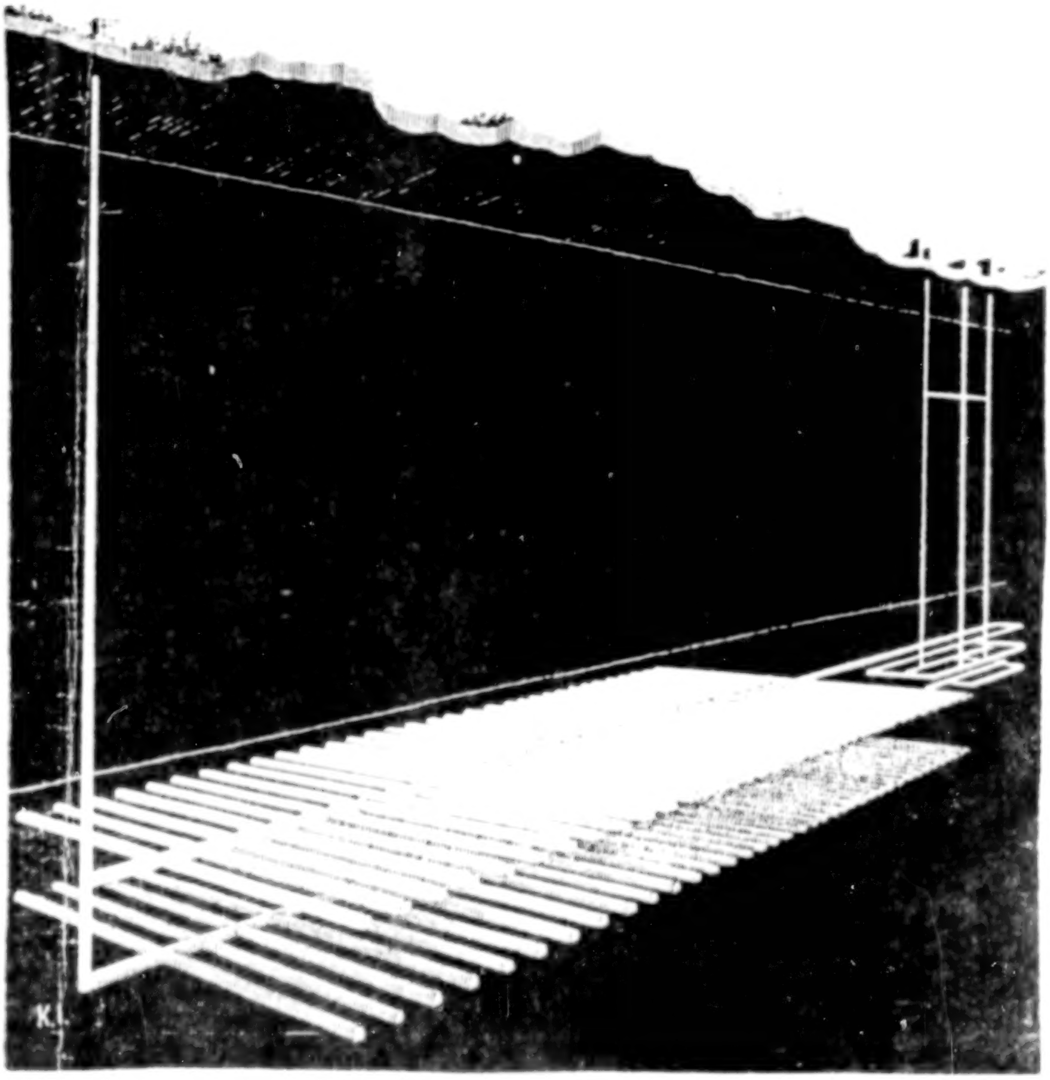

Figure. Final Grave for Nuclear Wastes

This is what will happen to the used uranium fuel of Sweden's nuclear power plants unless an even better solution is found. The nuclear waste will be buried in tunnels blasted into the basement rock at a depth of roughly 500 meters. The location of this so-called burial place has not yet been decided, nor is there any hurry to make a decision. The so-called temporary repository is nearly ready in the Oskarshamn bedrock, and the nuclear waste will be stored there about 40 years before it is transferred to its final grave.

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